Edited by

Jakub Kronenberg and Tomasz Bergier

Challenges of Sustainable Development in Poland

Sendzimir Foundation

Challenges of Sustainable Development in Poland

Authors

TOMASZ BERGIER, AGH University of Science and Technology, Krakow
Chapter: 12. Tools: 12.T1, 12.T2. Case study: 12.C1.

PIOTR BIELSKI, University of Lodz; Białe Gawrony Foundation
Chapter: 15. Tool: 15.T1. Case studies: 15.C1, 15.C2.

TADEUSZ BORYS, Wroclaw University of Economics
Chapter: 9. Tool: 9.T1. Case studies: 9.C1, 9.C2.

GISELA BOSCH, Plenum, Austria
Chapter: 4.

TOMASZ BUŻAŁEK, Lodz Sustainable Transport Initiative
Chapter: 11. Tools: 11.T1, 11.T2, 11.T3. Case studies: 11.C1, 11.C2.

MIKOŁAJ CZAJKOWSKI, University of Warsaw
Tool: 1.T1. Case study: 1.C1.

TOMASZ JELEŃSKI, Krakow University of Technology
Chapters: 6, 10. Tools: 6.T1, 6.T2, 10.T1, 10.T2, 10.T3, 10.T4. Case studies: 10.C1, 10.C2.

KAROL KONECZNY, Przedsiębiorstwo Transportu Samochodowego, Krakow
Tool: 7.T2.

AGNIESZKA KOPAŃSKA, University of Warsaw
Chapter: 13. Case study: 13.C1.

AGATA KOZŁOWSKA, Investment Support
Chapter: 13. Case study: 13.C1.

JAKUB KRONENBERG, University of Lodz
Chapters: 1, 5, 7, 8, 14. Tools: 1.T2, 5.T2, 7.T1, 7.T3, 14.T1, 14.T2. Case studies: 1.C2, 2.C2, 7.C1, 8.C1, 14.C1, 14.C2.

JOANNA KULCZYCKA, Polish Academy of Sciences, Krakow
Tool: 7.T2.

PRZEMYSŁAW KURCZEWSKI, Poznań University of Technology
Case study: 5.C1.

ANNA LEWANDOWSKA, Poznań University of Economics
Tool: 5.T1. Case study: 5.C1.

PIOTR MAGNUSZEWSKI, Centre for Systems Solutions, Wroclaw
Chapter: 2. Case studies: 2.C1, 2.C2.

ŁUKASZ MAKUCH, Polska Grupa Energetyczna
Chapter: 4. Case studies: 4.C1, 4.C2.

KAROLINA MALISZEWSKA, Sendzimir Foundation
Tool: 1.T3.

JAN SENDZIMIR, International Institute for Applied Systems Analysis, Austria
Foreword. Case studies: 2.C1, 2.C2.

MICHAŁ STANGEL, Silesian University of Technology, Gliwice
Tool: 10.T4.

MARTA STRUMIŃSKA-KUTRA, Kozminski University, Warsaw
Case study: 1.C3.

LESZEK ŚWIĄTEK, West Pomeranian University of Technology, Szczecin
Case studies: 6.C1, 6.C2.

TOMASZ ŻYLICZ, University of Warsaw
Chapter: 3.

Edited by
Jakub Kronenberg and Tomasz Bergier

Challenges of Sustainable Development in Poland

Sendzimir Foundation
Krakow 2010

Reviewers
Professor Ryszard Janikowski
Professor Leszek Preisner

Graphic design
Anna Wojtunik

Cover photo
Paweł Młodkowski

English language correction and proofreading
Alastor Coleby

ISBN 978-83-62168-01-9

Co-financed by the National Fund for Environmental Protection and Water Management

Co-financed by the Deutsche Bundesstiftung Umwelt

Sendzimir Foundation
www.sendzimir.org.pl

Contents

List of figures

Photograph credits
Pär Aronsson, SLU (12.3); Bo Björkdahl (12.11); Marek Budzyński (6.4); Tomasz Bużałek (11.3, 11.6, 11.8, 11.9); Tom Chance (10.7); Jakub Damurski (12.12); Andrzej Dunajski (12.9); Gizmo23 (6.2); Sabina Jaromin (12.10); Tomasz Jeleński (6.3, 10.4, 10.5, 10.6); Tymoteusz Lekler (photographs opening the parts of the book); Bobby Bogdan Mrozowski, Dubbletten (12.4); Maciej Mycielski (10.9, 10.10, 10.11); Andrea Rota (10.8); Paulina Wojciechowska, www.ehah.org (6.8).

List of tables

Foreword by Jan Sendzimir

Development of human society seems straightforward when seen through the perspective of the global average trends that appear overall as a smooth and steady increase in GDP since the start of the Industrial Revolution. However, this pattern appears more complex when we examine more closely particular regions, nations and particular periods. At this point the progress of development appears to be much more uneven and even uncertain. Notably the economies of nations of the global North have far outgrown those of the global South, and this has created economic, social and political distortions which continue to drive the annual migration of millions of people seeking better livelihoods. Although even Northern world development has often been shaken by booms and busts, these issues are greatly complicated by growing global uncertainty on how well-being can or should be measured. While globally the number of people earning only one dollar a day has declined, still more than one billion people have no access to fresh water, and two and a half billion lack sanitary services. How useful is financial capital (money) if other forms of capital (natural, social, human) are still not readily accessible for all? This is an open question vital to our understanding of development.

The challenge therefore of improving the development of social-ecological systems becomes more urgent as we recognize that humanity has only achieved its current levels of prosperity by pushing planetary natural capital and processes to their limits. To sustain these unprecedented levels of consumption for 7 billion people, humanity will be required to geo-engineer the planet. Even now human activity has become one of the critical drivers of global carbon and nitrogen cycles, and rapidly increasing uncertainty about the future of our climate and its biological productivity. Regional failures in managing resources (for example collapses of fisheries, agriculture and forestry resources) only add to global uncertainty about our capacity to guide and mitigate the future trajectory of development.

Sustainability emerged as a concept two decades ago with the aim of providing a more comprehensive framework in understanding and managing development in terms of human and environmental well-being. Efforts to broaden the framework in which we traditionally understand development reflect a fundamental premise that past failures were driven from the start by overly narrow visions and goals. Development paths aimed at maximizing only economic or political gains have brought about environmental, social and economic crises as a result. In response, society has often fallen into the trap of applying interventions that are narrowly focused on alleviating the immediate manifestation of the above crises by restoring only the economy or biodiversity. These short-term reactions rarely succeed in the long run and they eventually provoke the same or new problems, triggering the next stampede into yet another crisis.

Sustainability as a concept attempts to escape these recurrent traps by broadening a vision of development in a way that integrates ecological, economic and social domains. Whilst this conceptual foundation remains plausible, it has proven very difficult to communicate or implement broadly. In contrast to sharp and decisive impacts of narrow goals aimed at immediate targets, the concept of sustainability itself can appear imprecise and indecisive because of its attempts to integrate many different perspectives over a longer term. Implementing sustainability is further complicated by multiple path-dependences arising from the existing social (institutions), psychological (paradigms) and physical (infrastructure) structures in society. The inertia of 'how things have always

been done' limits understanding, long before new and innovative practices and their tools can be tested.

Thus the challenges to understand and implement the principles of sustainability are global issues, but the scales or levels at which these challenges should be addressed remain open questions. Some organizations like the United Nations or the World Bank work primarily at national and international levels to achieve global impact in this. However, the move from rhetoric to real change has been chronically slow at global level, and arguably too slow to successfully adapt even to current rates of change, let alone the accelerated rates anticipated under global environmental change, for example in the climate, the economy, and politically. One of the most notable examples of this is Europe's warming glaciers, a major source of fresh water which may disappear within the next 70 years if present rates continue. Therefore somehow humanity must nurture rates of learning and testing models of sustainability at a much faster rate than that of such environmental change if people are to mitigate its impacts.

This book reflects efforts to build the basis of sustainable development at more local levels where the speed of learning can be increased by working directly with local people and communities. That such an ambitious agenda is pursued in Poland should come as no surprise. For centuries Poles have a well-earned a reputation for shrewd innovation, and finding opportunities in hopeless situations all over the world. Negotiating uncertainty was a daily exercise in Central Europe's political and economic turmoil and in many other places around the globe where Poles have migrated to. Successful adaptation often required integrating an unlikely mixture of factors – an opportunistic magic by which Poles combined the 'useless' and undervalued into a working whole.

I experienced this magic on my first visit to Poland in the Autumn of 1970 when with nothing but butter and kapusta in the shops, food riots led to the fall of the Gomulka government. However, while the official economy declined, millions of Poles found unofficial ways to cooperate that made life possible. As a North American accustomed to the opulence of new buildings and cars, it was shocking to see cities with almost no paint, neon signs, or colour of any kind to suggest a pulse of life. It took me weeks to realize that the real wealth of Poland was to be found in the courage and wisdom of its people in the ways they collaborated and experimented to create a rich life out of few resources. I was deeply moved by the intelligence, compassion and humor that bubbled as the creative ferment of Polish life. With such wise resources we can find new ways to live even in a new climate when the world's historical resources, such as fossil fuels, are no longer available to us. If climate change forces us to de-carbonize our economy, many of the Industrial Revolution's fuels, technology and ideology will have to be abandoned. We will have to discover a new way into the future, and in Poland their innovative self-reliance provides a real model for wealth from which to create this new path.

This book offers a number of examples of Polish innovations, such as in sustainable architecture, spatial planning, low-energy appliances, business product chains, transport systems, and ecological engineering (notably solar powered waste digestion systems). Such innovation may only be a small step in meeting the present challenges to sustainability. However, new ideas are emerging all the time, but what will take humanity through rising global uncertainty to a secure future? Moreover, how will new ideas help us if they emerge from the same world-views that generated the problems that we face today? For example if the development of the internet is constrained only by 20th century profit motives, it may well fail to realize the full potential of staggering increases in our

power to store, compute and share information. Society would become more distracted by a big entertainment network than inspired by a virtual forum to mutually invent a new world. Innovation hijacked by our previous lack of imagination can only slow our transition to sustainability.

The challenge of nurturing alternative ideas when the socio-economic agenda is dominated by one paradigm is one that Poles know all too well. Centuries of occupation by foreign empires and ideologies never extinguished the Polish identity and spirit. The Polish language may have been forbidden in the schools, but real education continued in Polish at the kitchen table, where one learned what was really expected of you if you wanted to retain your dignity. Similarly today, the paradigm of economic growth still dominates the development agenda even as its side effects increase the destructive potential of global instability in our climate, ecology and society. But lurking in the shadows, ideas on sustainability have slowly developed through patient experimentation, and building evidence of the legitimacy of an alternative world-view that will remain standing when the inconsistencies of the present paradigm cause it to fail. This book explores many of the new ideas about economies, ecology and society, especially how they interact. Moreover this book aims to open up views on a very different world, one that can flourish without growing and prosper without polluting. Ideas that in Poland have emerged from decades of exploration by Poles can offer inspiration to everyone that they too can join experiments that demonstrate how we can live securely even in a world changing faster than it has done in living memory. Sustainability is not a credo to be adopted, it is an inspiration to test ideas and experiment. Polish experience in this regard teaches that to survive one has to get up and ride on the waves of change, even as we invent and build the vessels with which we will ride upon them.

Acknowledgements

This book forms part of the larger project, the Challenges of sustainable development in Poland, which has been carried out by the Sendzimir Foundation and the Centre for Systems Solutions. In addition to this book, the project comprises of the publication of the journal *Sustainable Development Applications*, creation of a social network service for sustainable development professionals, and the organisation of the Sendzimir Foundation's flagship activity, an international summer school that focuses on these issues. All of these activities were coordinated by Karolina Maliszewska and without whose involvement the publication of this book would not have been possible. The project benefited from financial support of the National Fund for Environmental Protection and Water Management, and the Deutsche Bundesstiftung Umwelt.

The book itself results from work and engagement with many people and we are grateful to the authors for their participation and for the texts they contributed. Above all, we would like to thank those authors who in addition read and discussed with us several chapters. We would like to thank in particular Anna Lewandowska and Tomasz Jeleński. We are also grateful to the reviewers for their comments which helped shape the book's final contents. In addition, at the various stages of the book's preparation, we consulted with many other people to whom we are obliged. Among whom we would like to thank Agnieszka Włodyka-Bergier, Anna Kronenberg, Professor Andrzej Rudnicki, Professor Stanisław Juchnowicz, Jan Sendzimir, Patrycja Romaniuk, Maciej Mycielski, Zbigniew Karnicki, Emilia Skrzypek, Dawid Piekło, Kajetan Czyż, Agnieszka Czachowska and Iwona Maciejczyk. Furthermore, we are indebted to Professor Tomasz Żylicz, Professor Tadeusz Borys and Anna Kalinowska for their support on the initial conceptual work for this book.

Finally, in preparing the English version of the book, we were supported by a number of translators who assisted us with several chapters: Patrycja Romaniuk (chapter 2), Marta Żylicz (chapter 3), Emilia Skrzypek (case studies 4.C1, 4.C2, 12.C1, and parts of chapter 12), Justyna Kaszubska (parts of chapter 5), Magdalena Wróbel (case studies 6.C1 and 6.C2), Katarzyna Koźlicka-Sauleniene (parts of chapter 7), Izabela Pastuszyńska (case study 7.C1), Anna Romańczyk (chapter 9), Olga Skorupka (chapter 13), Kajetan Czyż (chapters 8 and 14, introduction to part III and concluding remarks).

Preface

Sustainable development concerns each of us. It refers to the relationships between different elements of our surroundings: the economy, our society and the environment. Influencing these relationships at work or in our everyday life, we co-decide the development that takes place around us. Indeed, the media bombard us with news on sustainable development and the related environmental and social issues. Almost all important local, national and international documents invoke this concept, including Polish Constitution and the Treaty on European Union. Increasingly it is also used by businessmen who try to draw our attention to their responsible activities.

But what does sustainable development really mean? To illustrate what it means in practice, and the significance that it has for each of us, we shall use this book as an example. We do not only mean its contents but also the printed book itself as a product that shares many common features with other commodities available in the market.

As with any product, creating this book necessitated acquiring resources from the environment. Among other things, these were used to make paper and printing inks. Their production created pollution to the environment, and there, by means of natural processes, it is being neutralised. Also, this book, just like any other product, will ultimately become waste. On the one hand, this worries us as the book's authors, but on the other, we simply hope that the paper on which it was printed will be recycled, reducing its direct negative environmental impact. Besides the environment, society also played an important role in the creation of this book, we prepared it with the readers in mind, and we used products made by other people taken from natural resources (computers, other books, and computer networks, etc). We write more about these economy–society–environment interactions in chapter 1.

The book's impact on our surroundings should be analysed from a broad perspective, treating the book as part of a system of relationships linking the authors and readers, who may use it in various ways. This broad perspective is brought to us by systems thinking (chapter 2) used to analyse the reasons and consequences of our activities and mental models. Therefore, in presenting different aspects of sustainable development, we attempt to justify our mental models, referring to the theoretical foundations of sustainability which we go on to discuss in chapter 3.

A broad perspective on the book requires adopting a product life cycle perspective (chapter 5). The process of production involves the above mentioned use of resources and other ecosystem services, but this also reaches further than we usually tend to think it does. When preparing our chapters, we spent many hours in front of computer screens, using energy. Meetings were also necessary, during which the contents of this book were discussed in detail, leading to pollution related to transportation. For our work, we also needed light in our buildings and the buildings themselves (as we shall see in chapter 6, even in this area we can reduce our impacts, for example by using building materials with certain properties, more effective use of daylight, and better integration of a building into its surroundings).

The process of production requires cooperation with other links in a supply chain (chapter 7). When preparing this book, we attempted to work with local suppliers who were able to provide the desired standard of service or product quality. Choosing paper, we paid attention to its environmental impacts, the book itself is printed on 100% recycled paper and its cover is not coated with plastic foil.

Finally, for two reasons we also decided to publish this book in electronic form: to ensure its high accessibility, and to reduce the above environmental impacts related to print production. The electronic edition permits us to reduce the need for resources at the production stage (although it still requires energy consumption during the phase of use). Another form of increasing the efficiency of utilisation of resources and other ecosystem services in book production is increasing the intensity of its use. Among other places, the book will be available in libraries, where one copy will be shared by many readers so that everybody will have an opportunity to use it, without owning it. Indeed, a similar idea of replacing products with services can be applied in the case of many other objects (chapter 8).

So far, we have paid attention to the so-called direct aspects related to resources and other ecosystem services used directly in the book's production and use and necessary for its end-of-life management. In the case of a product of this kind, and this book in particular, the indirect aspects may turn out to be more important than the direct ones. These are designed to draw the readers' attention to the challenges of sustainable development and providing tools that support the realisation of this concept, aka the 'solutions'.

This book is both a guide for sustainable development professionals and a handbook for those interested in studying the subject. We hope that it will not only explain and illustrate the issues discussed, but will also be used by practitioners in business, local authorities, non-governmental organisations and, indeed, also by individuals, wanting to undertake activities aimed at sustainable development. If it turns out to be helpful and inspires activity, its indirect positive impact will most probably neutralise the negative consequences of its production.

Both in business and in local authorities, activities aiming at sustainable development should be undertaken within a clear management structure, determining programmes and indicators of their realisation, and highlighting cooperation with various stakeholders. We present this kind of management system separately for companies (chapter 4) and local authorities (chapter 9). In business, such a system refers to the above mentioned direct and indirect aspects or product's environmental and social impacts throughout its life cycle. In local authorities, it refers to other areas of planning, for example spatial planning which, for environmental and social reasons, should favour higher density, and the use and revalorisation of existing resources (chapter 10). Spatial planning is closely related to the organisation of transport systems (chapter 11). These two areas are complemented by municipal utilities management which should use solutions adapted to local needs and conditions, including ecosystem services (chapter 12). Increasing the efficiency of carrying out public tasks in the areas above, local authorities can be supported by the private sector within a public-private partnership (chapter 13). This highlights the importance of cross-sectoral cooperation for the realisation of sustainable development tasks, alongside the cooperation of business and local authorities with local communities and individuals.

From the point of view of economics, every reader is a consumer. As consumers we make decisions regarding our purchases, and thus about what products and services are delivered to the market. We choose products in paper or electronic version (dematerialised), and it is up to us what happens to a product after the end of its useful life (chapter 14). From the point of view of sociology, both readers and authors are also citizens. As citizens, we live as an integral part of a society, composed of other people. Our linkages with them constitute the social capital that makes taking collective actions possible (chapter 15).

Working on this book, we used and further built on our social capital. The authors include specialists from different disciplines, bridging theory and practice, which simultaneously illustrates the interdisciplinary character of sustainable development. Following this open approach, every reader can contribute to future versions of this book. Thus, we encourage everybody who sees the potential of sustainable development to contact us, both with comments on the book and with regards to various sustainability initiatives. The effects of activities undertaken by readers will determine whether the positive indirect aspects of this book outweigh the negative direct aspects related to its production as noted above.

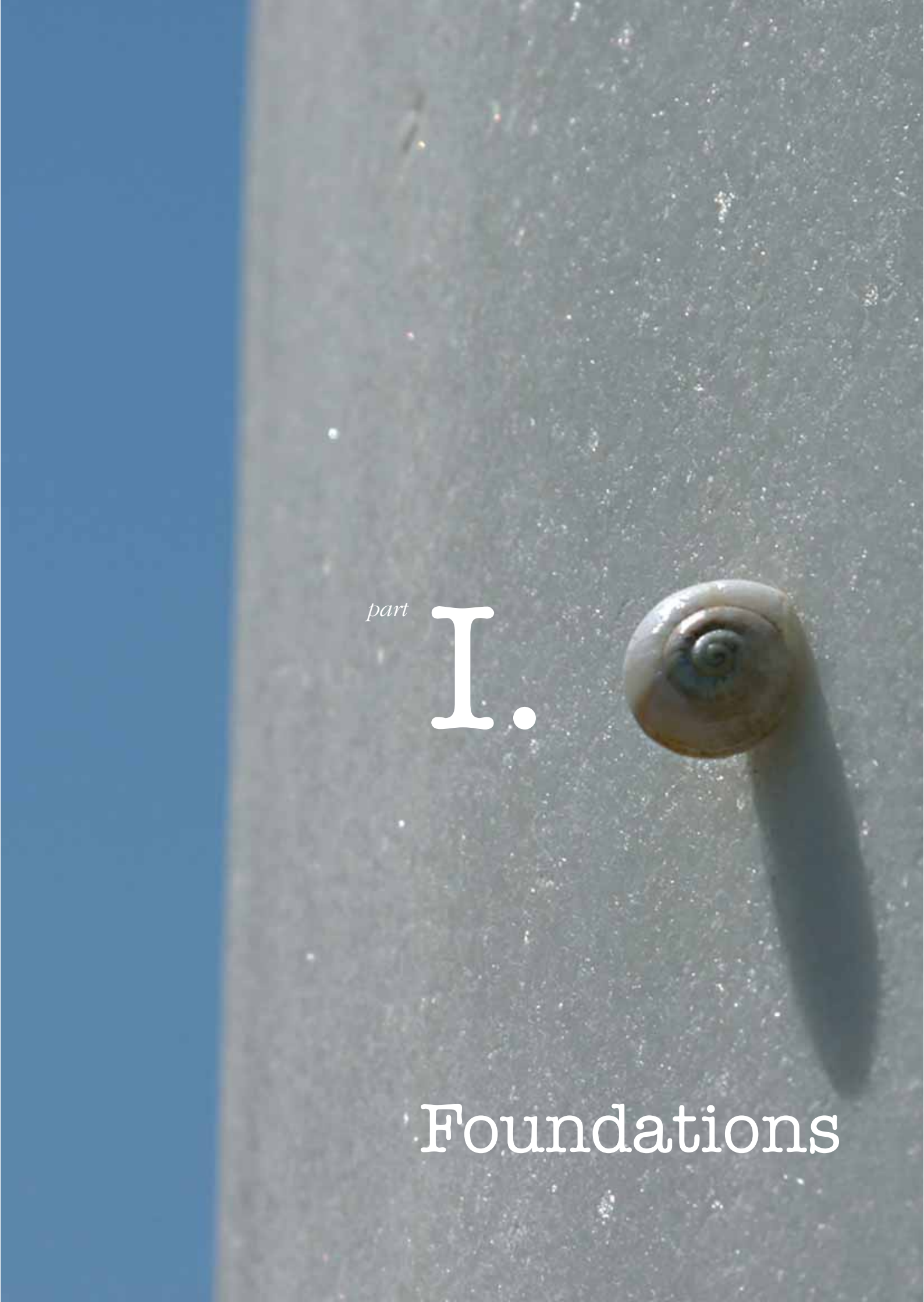
Before we invite the readers to read the rest of this book, we feel obliged to introduce its contents in a more traditional way. The above description indicates that the book comprises of four parts. The first part presents elementary issues, crucial for the proper understanding of sustainable development. The other three parts refer to practical aspects relating to the implementation of sustainable development in business (part II), local authorities and communities (part III) and by individuals (part IV). To some extent, this division is arbitrary and some topics might also appear in other parts (as reflected in many references to issues presented elsewhere in the book).

The chapters are divided into the following elements.[1]

- The main part of each chapter discusses the basic issues related to a given area, identifying the most important challenges and solutions. This is illustrated with numerous international and Polish examples.
- Tools (symbol T, displayed in boxes within the main part of each chapter) present solutions that support sustainable development, used both in Poland and internationally.
- Practical resources are meant to help implement solutions referred to in each chapter.
- Questions are posed to stimulate thinking on the issues discussed and relate them to the reader's own context.
- Case studies (symbol C, placed on darkened pages in the end of the chapter) originate from Poland (except from case study 2.C2). They illustrate the challenges for sustainable development and the diversity of solutions that have emerged in respect to them. Each case study is followed by 2–3 questions.

We focus our attention on Poland. Foreign examples are also used to illustrate the important issues related to sustainable development, or as examples of its implementation, which so far are lacking in our country. The 23 case studies and numerous smaller examples spread throughout the book demonstrate that we already have important achievements in this area. For sure, they can inspire further actions, but they also may provide a convincing set of arguments for those who are not yet convinced that sustainable development is possible in Poland or in other Central and East European countries.

[1] With the exception of: chapters 2, 4, 8 and 13 which have a practical focus and thus do not have separate tools, and chapter 4 which has a theoretical focus and thus has neither tools nor case studies.



part

I.

Foundations

Introduction to part I

Just as the construction of any building begins with the foundations, we start this book with three chapters to introduce the elementary concepts and problems that relate to sustainable development. We shall refer to back to these concepts in the parts that follow in this book, using the initial concepts to build more detailed visions of sustainable development in the different spheres of human activity.

Chapter 1 refers to economy–society–environment interactions; these are the three systems where their interests need to be balanced with one another within the concepts of sustainable development. In particular, we shall look at ecosystem services used by the economy and by society; the external costs of human activity; our ignorance of economic–social–environmental interactions; and the role of institutions, social capital and social participation. We shall also get to know the fundamental principles followed in the concepts of sustainable development. One of which is adopting a systems approach to studying and shaping the above interactions, which we explore in detail in chapter 2.

The systems approach (or systems thinking) allows us to see the connections between the economy, society and the environment, and the approach provides tools that can be used to analyse and represent these connections. One of the most important concepts discussed in chapter 2 is mental models, to which we shall return many times later in the book (mental models are our ways of thinking or convictions that reflect our understanding of the world). The tools that we shall use, such as causal loop diagrams, will help us to represent our mental models. If we create such a diagram with a group of different stakeholders, we can see the differences and commonalities in our understanding. Based on this, we can then start to elaborate a common vision of development, incorporating the needs of the three interactive systems noted above.

In chapter 3, we refer to the most crucial aspect of sustainable development known as sustainability. According to the popular definition, sustainable development fulfils the needs of both current and future generations. This is even more difficult than balancing the interests of the three systems that currently exist because we do not know the mental models of future generations, neither do we have their representatives. In this context, we must consider how to take care of the interests of future generations, using currently available forms of economic, human and natural capital. We also discuss which indicators can be used to assess how successful we are in achieving sustainable development.

To illustrate the basic interactions we use three examples: valuing the Białowieża Forest (case study 1.C1), cod fishing in the Baltic Sea by Polish fishermen (case study 1.C2) and the functioning of a chipboard factory, located in a region of natural interest (case study 1.C3). All of these case studies demonstrate the significance of the environment from the perspective of the economy and society, and the need to adopt a long-term perspective when assessing human activity. Also, they show that economic decisions have to incorporate the opinions of people whom they might affect. The first three case studies illustrate the problems that we face in Poland in attempting to make the concept of sustainable development a reality.

Referring to the management of river valleys: the Barycz in Poland (case study 2.C1) and the Tisza in Hungary (case study 2.C2) case studies in chapter 2 illustrate the complexity of interactions that have to be taken into consideration when planning

for sustainable development. We explore the role that stakeholder dialogue played in both cases because without the involvement of inhabitants, a development vision imposed from outside of the region could not have been called a 'sustainable development plan'. In fact later in this book, we shall also frequently emphasise the importance of social participation and of creating conditions to involve local communities in decision making that will affect them.

Chapter 1.

The economy, society and the environment

1.1. Introduction

It is early in our life that we learn about natural (environmental) barriers to the development of human societies. We find out that agriculture is not possible high in the mountains, or far in the north; we perceive the natural borders that large reservoirs, rivers or immense forests constituted for the people. We realise that these natural conditions affected the development of various societies, and indeed influenced the shape of the modern world. Ultimately, however, the fates of different societies depended not so much on the environment as they depended on their own ability to use it and to defend themselves from the negative consequences of their own impacts on the environment.

Before we start discussing modern interactions between the economy, society and the environment, we should take a brief look at their history. Diamond (1997) remarked that the advantages of various societies often depended on their military and maritime technologies, centralised political organisation, writing that permitted referring to thousands of years of experience, and germs to which those societies had become resistant. However, the fates of human societies and the modern world were ultimately dependent on natural conditions that facilitated the transition from hunter-gatherers to sedentary lifestyles and the resultant changes in social organisation. Thanks to these factors, population numbers increased, along with their military potential, and new social groups emerged. For the first time, these changes took place around 12,000 years ago in the so-called Fertile Crescent, the cradle of the first cities, empires and large civilisations of the Middle East. Why then has this place not become the centre of the modern world?

The Fertile Crescent's advantage over other areas of similar climate depended on further natural conditions, such as the size of this area, and its climate, topographic and biological diversity. These translated into the higher diversity of options available to humans. Finally, Fertile Crescent has become a dry area, largely a semidesert or a desert, economically and socially backwards, as we know it today. Again, this resulted from the natural conditions, this time combined with a human factor. The Fertile Crescent turned out to be a fragile ecosystem, particularly vulnerable to changes introduced by humans. Low rainfall reduced forest regeneration possibilities (and forests were cut for agriculture, building materials and energy), as well as the possibilities of regeneration of other green areas (overexploited by goat grazing). The disappearing of tree and grass cover increased erosion and river siltation, and irrigation led to increased salinity of rivers.

The societies living in the Fertile Crescent, unaware of the consequences of their activities, committed an ecological suicide (ecocide), destroying the ecosystem, thanks to the opulence by which they had prospered. The political and economic centre was gradually moving northwest, where ecosystems were more robust and resistant to human influence, and further stages of social development (emergence of merchant class, capitalism, intellectual property protection, science and research) finally decided Europe's significance.

The Fertile Crescent is just one of many spectacular examples. Other societies precluded their development opportunities, destroying the environment on which those opportunities depended. Having reviewed several dozen of such examples (including Easter Island and the Maya), Diamond (2005) identified eight principal reasons for an unintended ecocide. They refer to the excessive exploitation of the environment (ecosystem degradation, for example overfishing) and the increase in population and the related environmental impacts (per capita). Clearly, in many instances, a combination of these factors occurred including demographic growth which exerted excessive pressure on the environment, eventually leading to food shortages and conflicts over access to resources.

These societies were not aware that they had exceeded their ecosystem limits because to them resources seemed plentiful; other changes in the environment hid the crucial phenomena; key changes were masked by their own variability (seasonal, annual or longer). Often, and also in modern times, the complexity of ecosystems, made the consequences of human interference unpredictable. It was even more difficult for illiterate societies who could not refer to comparable experience from the past. In some cases, decision making procedures were inadequate or decisions were made by people unaware of the local conditions. In others, collapse resulted from rational economic behaviour of a narrow ruling class who could earn a lot on environmental degradation. There was no opposition from ordinary people who were the real losers, but who did not have the knowledge or the possibilities to organise themselves to protect their interests.

Eventually, these societies collapsed because of their own activities (or lack of responsive activities) referring to environmental problems experienced by these societies. Their activities were driven by political, economic and social institutions created within society, and on its values. Their collapse resulted from poor social capital, and market, government and or empowerment failures.

Societies that committed an unintended ecological suicide included those that were the most developed and complex in their times. Today, we can learn not only based on our own experience but also on theirs. Indeed, there are many similarities between the societies described by Diamond (2005) and the modern world. In this context, in this chapter, we take a closer look at the interactions between the economy, society and the environment, and in the chapter that follows we study systems thinking in order to analyse the interactions between these systems even more so.

The historical review above demonstrates a number of phenomena, crucial from the point of view of economy–society–environment interactions. We refer to them in the following sections on:

- the dependence of the economy and society on the environment (section 1.2);
- external effects of human activity (1.3);
- the problem of ignorance (1.4);
- the role of institutions and social capital in sustainable development (1.5); and
- the significance of sustainable development (1.6).

We analyse how the issues described relate to Polish circumstances in how much ecosystem services are worth (case study 1.C1 on Białowieża Forest); how we depend on those services (case study 1.C2 on Polish cod fishing in the Baltic Sea); and how companies, local authorities and communities can co-decide on sustainable development (case study 1.C3 on a chipboard factory set in a touristically attractive town). We also introduce several tools used in the implementation of sustainable development,

such as non-market valuation methods, used i.a. in the valuation of ecosystem services (tool 1.T1); means of forcing the internalisation of external costs (tool 1.T2); and social participation as a method of involving local communities in decision making (tool 1.T3).

1.2. The dependence of the economy and society on the environment

Almost every day we hear about environmental problems, such as the greenhouse effect, pollution of rivers and oceans, and overfishing. We are increasingly aware that we contribute to these problems and that they have direct consequences for ourselves, affecting our lives, health and well-being. In most cases however, our awareness of these issues depends on their presence in the media (Bołtromiuk and Burger, 2008).

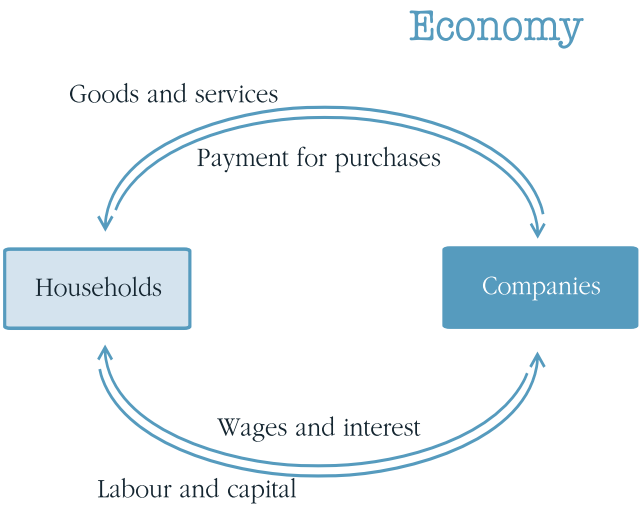
Low levels of awareness of economy–society–environment interactions are one of the main barriers to sustainable development. Businessmen who are not aware of their impact on the environment, cause costs which are borne by other social groups (external costs). Analogous costs are also caused by consumers who do not analyse the consequences of their decisions on their surroundings.

Many economics textbooks (for example Samuelson and Nordhaus, 1998; Begg et al., 2005) present a standard diagram that describes the economy as a set of interactions between households and companies (figure 1.1a). These interactions focus on two issues:

- households pay companies for goods and services that companies offer to households; and
- companies pay households for labour and capital that households provide to companies.

Every diagram requires simplification and everybody realises that the real economy is much more complex. However, there is a risk that without a relevant commentary, a simplification may replace the real picture. Without an additional explanation, one may have the impression that figure 1.1a represents an independent, self-reinforcing system. But where do the products that are created within our economy come from? What happens to them when they are replaced by their new counterparts? These two questions refer to the most obvious linkages between the economy and its surrounding environment. The fact that they do not fall within the scope of economic thinking of companies leads to external effects. Every product created within an economy requires resources originating from the environment. Even non-material services require resources, such as those used to create products and the means of transportation essential for the provision of those services. Ultimately, every product becomes waste and in this form it returns to the environment. Figure 1.1b depicts these basic interactions.

1.1a



1.1b

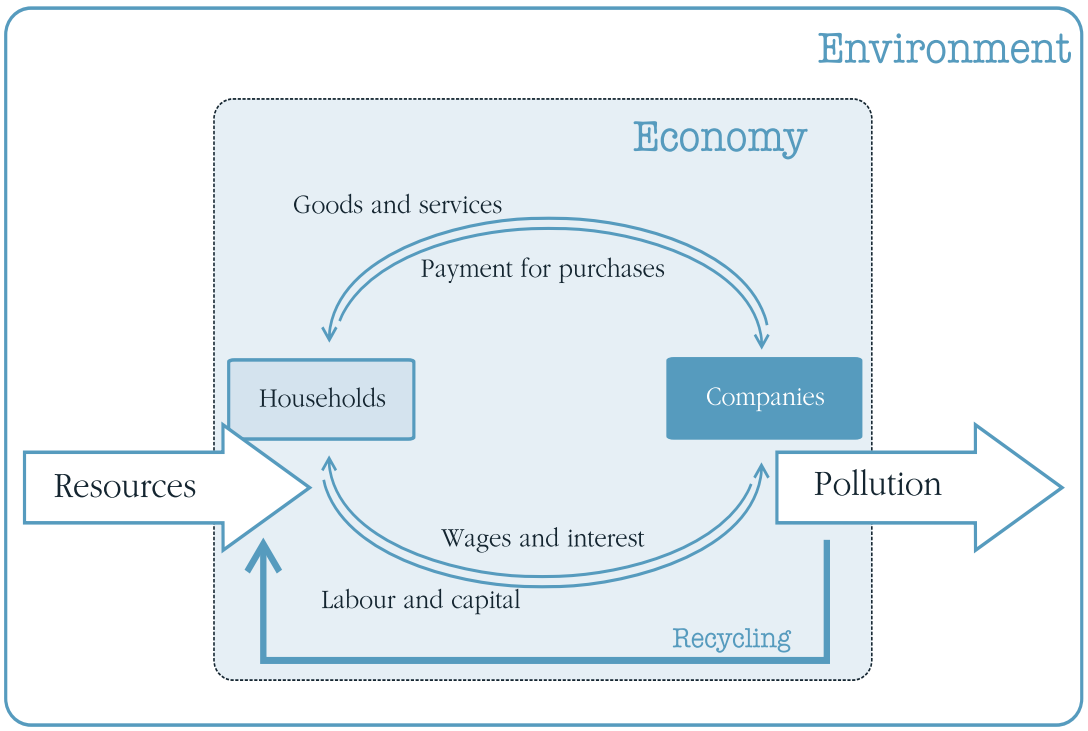


Figure 1.1. The economy and the environment: the environment omitted, as in many economics textbooks (1.1a) and the environment presented as source of resources and recipient of pollution generated in economy (1.1b)

In reality, the above two linkages are much more complex. The environment restores resources used within an economy for which this service is called the production of goods. However, the environment provides an economy not only with goods directly used in products exchanged in the market but also with many others, used indirectly (for example oxygen used in the processes of combustion).

At the other end, waste that is sent to the environment does not only comprise product residues but also other types of pollution that result from production, transportation or use processes. A fraction of this waste is subject to recycling and returns to production. The rest ends in the environment where it becomes part of the natural circulation of matter. The environment absorbs and neutralises pollution, fulfilling the self-purifying service of regeneration. Nevertheless, while some substances can be neutralised relatively quickly, others linger in the environment indeterminately long.

The environment provides a diversified stream of services, some of which we do not yet know, but indispensable for our existence, activity and well-being.[1] Without them, economic activity would not be possible, and neither would be the existence of human societies. The environment provides living space and life-ensuring conditions that include the provision of food and air for breathing, and a stable climate. These services are provided by both natural ecosystems (for example oceans and forests) and ecosystems transformed by humans (such as farmland).

Studying the environment, we often realise that natural ecosystems can replace many services provided by complex man-made systems (see case study 2.C2). For example, tits can be used in orchards for the protection of trees and fruit against pests (Mols and Visser, 2002), trees in cities can improve urban air quality, simultaneously reducing demand for air conditioners and heating (Szczepanowska, 2001), and adequately-designed gardens can be used for treating wastewater (chapter 12).

The value of ecosystem services, both those of use and non-use character, can be expressed in monetary terms (tool 1.T1; case study 1.C1). Valuation results can be used in the assessment of external costs of economic activity or in the analysis of costs and benefits of planned investments. Costanza et al. (1997) estimated that the total value of ecosystem services exceeds global GDP by at least 80%.

Table 1.1 presents examples of ecosystem services classified into four categories, which are used by the economy and society and upon which these systems depend:

1. production of goods;
2. regeneration;
3. stabilisation; and
4. quality of life.

The production of goods and regeneration are described above. Stabilisation refers to the provision of relatively constant and durable conditions that facilitate the functioning of the economy and society. Indeed our existence in its present form would have been impossible had environmental conditions been constantly changing. Quality of life signifies things such as aesthetic and recreational functions, but also includes inspiration (using nature as a model to imitate through man-made solutions; see section 5.3).

[1] As a result of the Millennium Ecosystem Assessment, the biggest attempt to identify ecosystem services thus far, three volumes have been published discussing their state and significance: Hassan et al. (2005); Carpenter et al. (2005); Chopra et al. (2005).

Table 1.1. Ecosystem services (Daily, 1999)

Service category	Subcategory	Examples
Production of goods	Food	Animal and plant products Honey Herbs
	Pharmaceuticals	Medicinal products Precursors to synthetic pharmaceuticals
	Durable products	Timber Natural fibres
	Energy	Biomass fuels Low-sediment water for hydropower
	Industrial products	Waxes Oils Fragrances Dyes Latex Rubber Precursors to many synthetic products
	Genetic resources	Intermediate goods that enhance the production of other goods
Regeneration	Cycling and filtration processes	Detoxification and decomposition of wastes Generation and renewal of soil fertility Purification of air and water
	Translocation processes	Dispersal of seeds necessary for revegetation Pollination of crops and natural vegetation
Stabilisation	Coastal and river channel stability Compensation of one species for another under varying conditions Control of the majority of potential pest species Moderation of weather extremes (such as of temperature and wind) Partial stabilisation of climate Regulation of hydrological cycle (mitigation of floods and droughts) Protection against UV radiation	
Quality of life	Aesthetic beauty Cultural, intellectual and spiritual inspiration Existence value Scientific discovery Serenity, relaxation Maintaining the elements of the environment that can potentially be useful in the future	

The economy and society constitute elements of a larger, natural system and depend on them for their subsistence. Sustainable development requires that economy–society–environment interactions are shaped in a way that does not affect the ecosystems' capacity to provide their services in the future. This condition was not fulfilled by the societies described by Diamond (2005). Furthermore today, the pressure exerted on the

environment by the modern economy and society put our capability to obey that condition in doubt.

Finally, our pressure on the environment, like the modern economy and society, has an international character. Increased population numbers, along with increased production and consumption levels, translate into increased demand for ecosystem services. Two principal categories of services: the production of goods and regeneration come under particular pressure (Hassan et al., 2005). The impression that rich countries are already on the sustainable development path may also be distorted by the international external effects that they cause that relate to the production of goods received from other countries.

Tool 1.T1.
Non-market valuation methods

Economic value of a good comes from the willingness to exchange other goods for it. In essence, it is the rate at which this exchange could take place. In particular, one may wish to exchange a good for money. This is straightforward for typical consumer goods, for which we can observe market prices (i.e. how much we pay for them). The issue becomes more complicated when there is no market for a good that we want to value when it is an environmental or public good that is typically not bought and sold on the market (for example clean air, a city park, and endangered species).

Not having a market price does not mean that such a good does not have any value. As long as consumers would be willing to exchange some of their goods (money) for the presence or access to the environmental good it has some economic value. This value, however, might be difficult to estimate, since no transactions take place and hence we cannot observe an exchange rate.[2]

Economic science has developed methods, which allow estimations of the value of a non-market good. These methods aim at examining consumers' preferences over the good. They can generally be assigned to two categories: (1) *revealed preference methods* and (2) *stated preference methods*. The first category uses a related market good, for which prices are known, to conclude the value of an environmental good. These methods usually provide a lower estimate of the value, however, even this on many occasions may still be informative. The other category, the stated preference methods are based on asking consumers hypothetical questions. Based on the choices they make in hypothetical scenarios one can learn something about their preferences, and draw conclusions on the value of a non-market good. Below, we briefly characterise examples of these methods.

The productivity method

In some cases, when availability or quality of an environmental good is important for producing other goods, its availability or quality can be used to estimate how this environmental good contributes to production, and hence what its value is. For example, the lower bound of the value of an improvement in water quality of a river

[2] As an aside, the value of a public good has nothing to do with its cost of provision. The value comes from consumers' willingness to pay. The cost can be below or above this value. In some cases, very valuable goods can cost only a little, while in others, cost of providing a good may be much higher than what consumers would be willing to pay for it.

can be estimated based on value of the improved fishing yields from the river or reduced cost of treating river water, if this water is used for producing juice for example.

Replacement cost, substitute cost, avoided damage methods

These methods hinge on the costs of replacing or substituting an environmental good if it was to be destroyed. For example, if wetlands along a river provide flood protection, destroying the wetlands would have to be compensated by building river dams and embankments along the river or recreating the wetlands elsewhere. Alternatively, one would have to consider the possibility of the damages that could occur, if the additional flood protection provided by the wetlands is removed. The value of the wetlands can hence be estimated based on the lowest of the three categories above (man-made substitutes, replacement, and potential damages).

The hedonic price method

In cases where the presence or quality of an environmental good influences prices of other goods, one can sum these price premiums to estimate the value of the environmental good. This method is most widely used in the real estate market. For instance, prices of houses can be influenced by the presence of clean lake or a natural forest. If enough data is collected statistical methods allow for all the other differences between the house next to a clean or dirty lake. Then the difference in price is multiplied by the number of houses around the lake to estimate the value that the clean lake has (i.e. how it increases real estate prices in its vicinity). Other examples of the use for this method include: wage differences caused by increased accident risks, price differences for organic or fair trade goods and many others.

The travel cost method

Some environmental goods that are used for recreation may be available for free, however, this does not mean that they have no value. Visiting such a site for recreation is usually associated with some cost, even if it costs nothing to enter. To get to a park, a forest, or have a hike in mountains, one has to travel there first. Travelling means incurring some cost, such as the price of fuel, train ticket, and time spent travelling that could be used in some other way. If consumers are willing to spend money to get to a place it means that being in this place is worth more than the cost they have to incur. This observation allows us to estimate the value of such a good by estimating cost per visitor and for a number of visitors one can calculate the lower bound of a value of say a national park.

The contingent valuation method

Asking a person how much he or she would pay for an environmental good (for example for protecting a whale species) requires that the questions posed are soundly constructed. In particular, the respondents are presented with a carefully developed scenario of provision of the good, the cost for them, and then asked to answer a close-ended (yes or no) referendum format based questionnaire. It has been shown that in this way the respondents' answers can be expected to be true, even if they are hypothetical. Based on the results of such a survey, one can employ statistical methods to estimate the value of a non-market good.

The choice experiment method

It was following the use of conjoint analysis in marketing, that economists developed the choice experiment method. It is an extension of contingent valuation, in which respondents of hypothetical surveys are presented with hypothetical scenarios. However, here

instead of asking a for or against question, the respondent is presented with a set of alternatives and asked to choose the one he or she prefers. The alternatives are composed of attributes that describe an environmental good. Respondents' answers reveal not only their preferences for entire scenarios but also rates at which they are willing to trade-off one attribute for another. This provides a researcher with the possibility of not only estimating a value of an environmental good but also the implicit prices of the attributes.

1.3. External effects

Markets do not always function well and in the case of some products and services, they do not even exist. Both situations are known as market failures and they are listed among the most important reasons for the overexploitation of ecosystem services. Indeed, as we saw in the previous section, there are no markets for many ecosystem services. This occurs when no property rights have been defined (not even common or state property) for many crucial elements of the environment, for example the atmosphere (Żylicz, 2004, p. 22). In other cases, such as the oceans, property rights are not defined or enforced well enough to prevent overexploitation. In such cases, when one of the parties to a transaction is missing, this is equal to the lack of a market. Thus, without the proper definition of property rights, we cannot solve problems with the use of a free market, a solution traditionally preferred by economists.

External effects which may result in environmental degradation provide another example of market failure. If an element of the environment that receives pollution has no owner, or if its owners do not enforce their rights, the polluters may abuse this situation. Thus, they overuse the regeneration service of an ecosystem, while others who would like to use the related production function lose out.

Let us use a river as an example. Those who pollute cause costs for those who use the river for fishing or a source of drinking water. The latter lose benefits related to fishing and water, pay the costs of treating illnesses caused by the consumption of polluted products from the environment, and potentially also pay the costs of restoring the river. External costs include lost benefits and expenses made to remove the consequences of external effects (for example the costs of treating illnesses related to water pollution).

In the same vein, overexploitation of a resource, resulting from the lack of a market or a malfunctioning market, leads to costs for other users of this resource, including future generations.[3] This situation brought about the collapse of many societies, including those inhabiting the Fertile Crescent described earlier. Long-term external costs illustrate another barrier to sustainable development in that future generations are not able to protect their interests (see section 3.2).

External costs are not reflected in the prices of goods and services traded in the market. Thus prices, the most important element of a market mechanism, provide signals based on which buyers of those products and services are likely to make decisions potentially contrary to their preferences. The costs of environmental degradation linked to economic activity (including production and consumption) are

[3] This was popularised by Hardin (1968) who put forward the 'tragedy of the commons' concept.

borne by society as a whole, including the inhabitants of other countries[4] and of future generations.

Economic activity shaped by such an inadequate system of prices is costly (Coase, 1937). Thus, the concept of sustainable development has embraced the polluter pays principle as one of its own in that external costs should be borne by those who cause them. Many environmental protection policy instruments have emerged that are used to force the internalisation of these costs (tool 1.T2).

To ensure the internalisation of external costs, first one has to estimate their value. Economists have undertaken such attempts with reference to many types of economic activity. As it can be seen from the Review of the Externality Data database, such attempts have been most frequently with reference to the external costs of energy generation, transportation and waste management.[5] For example, in 2000, external costs of transportation in the 15 European Union countries, Norway and Switzerland amounted to 650 billion euro, constituting 7.3% of those countries' GDP (Schreyer et al., 2004). 83.7% of those costs were caused by road transport, 14% by air transport, 1.9% by rail and 0.4% by inland waterways. Passenger transport caused 67% of costs and freight transport 33%. Average external costs for different types of transportation are presented in figure 1.2. This study covered costs related to accidents, air pollution, climate change, noise, landscape and nature degradation, and the destruction of urban space. Costs of congestion were not considered in the comparisons, as they characterise road transport only.

The same methodology was followed in a study of external costs of transportation in Central and Eastern Europe (OECD, 2003). Total external costs of transportation amounted to 40 billion euro (in 1995), equal to 14% of GDP of the studied countries.[6] Road transport caused 87% of costs, 40% of which were related to passenger cars alone. The structure of average costs of different means of transport was similar to the relevant structure in Western Europe presented in figure 1.2 but they were lower:

1. passenger transport (euro per 1000 passenger-kilometres):
   - road – 26.4;
   - rail – 12.1;
   - air – 5.5;
2. freight transport (euro per 1000 tonne-kilometres):
   - road – 44.0;
   - air – 25.1;
   - rail – 7.8;
   - waterways – 2.4.

Higher shares of external costs in GDP reflect a larger burden of environmental and social costs of transportation in Central and Eastern Europe. The OECD forecasted significant potential for lowering the external costs of transportation in Central and Eastern Europe, compared to those of Western Europe. This potential was supposed

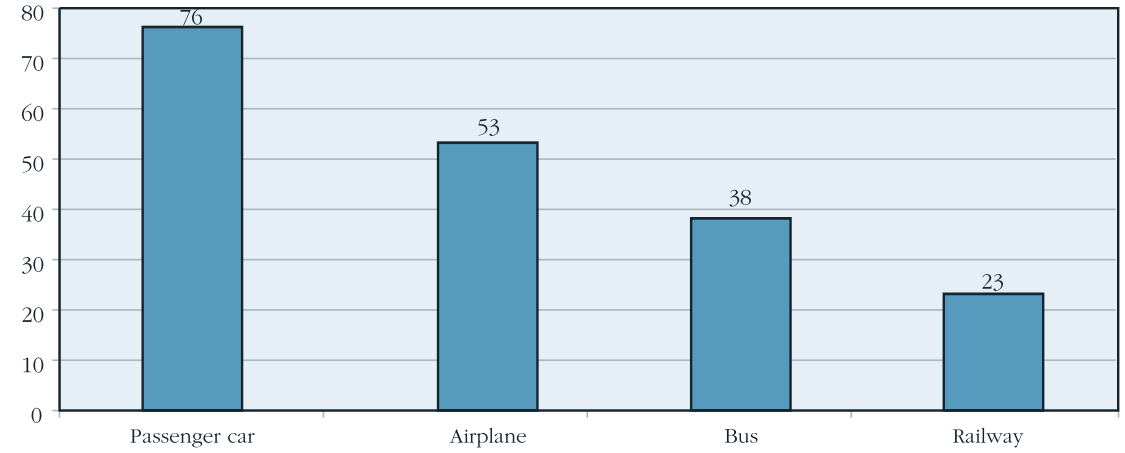
[4] Many environmental problems have an international character which justifies international undertakings aiming at solving those problems. For example, air pollution generated in Poland migrates to the north and to the east of Poland. To counteract air pollution, in the 1990s it was economically efficient for Sweden to invest in environmental protection in Poland. Reducing pollution in Poland was preferred over further investment in the same activity in Sweden, because Polish technologies were not as efficient as those used in Sweden.

[5] The RED database was created in the years 2002–2003 and comprises studies performed until that time. Its online version <www.isis-it.net/red> lists over 1600 examples. The methodology of estimating external costs for the energy sector was elaborated within the Externe research project <www.externe.info>.

[6] 14 countries included in the study were: Albania, Belarus, Bosnia-Herzegovina, Bulgaria, Croatia, Czech Republic, FYRO Macedonia, Hungary, Moldova, Poland, Romania, Slovak Republic, Slovenia, Ukraine. In the case of Poland, external costs were estimated at 12.6 billion euro.

to result from the possibility of modernising the means of transportation and to use railways to a larger extent. However, although modernisation has occurred, the significance of railways has decreased during the transformation of the Polish economy (GUS, 2000, pp. 330–331; GUS, 2009b, pp. 361–362), which prevented the realisation of the OECD's optimistic forecast.

1.2a



1.2b

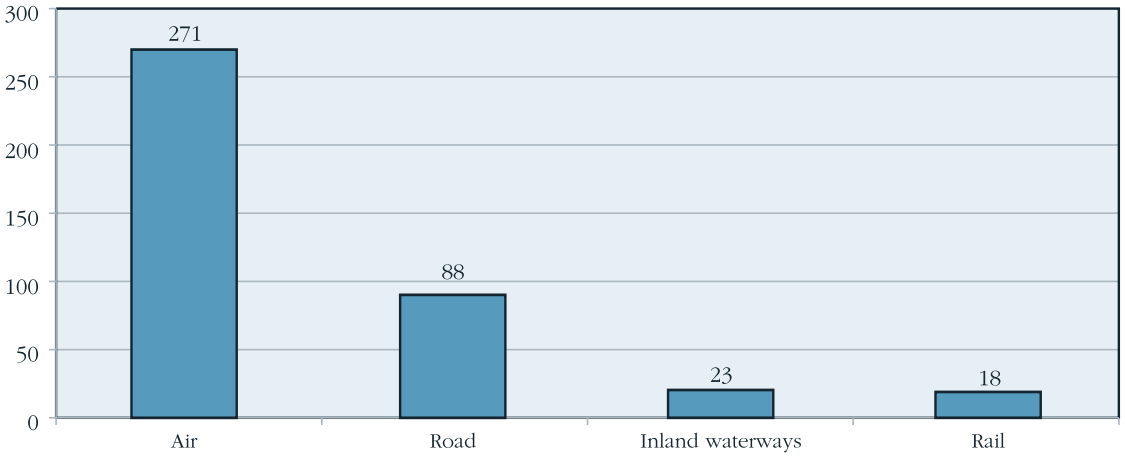


Figure 1.2. External costs of passenger transport (1.2a) in euro per 1000 passenger-kilometres and freight transport (1.2b) in euro per 1000 tonne-kilometres (data for 2000 for 15 EU countries, Switzerland and Norway; Schreyer et al., 2004)

Within its sustainable development activities, the EU pays much attention to making the costs of transportation real and thus reducing this sector's pressure on the environment. Based on a handbook presenting best practice and suggestions on how to estimate external costs of transportation (Maibach et al., 2008), changes in the legal system have been discussed, such as on the rules on payments for the use of road infrastructure. However, outside energy generation, transportation and waste management, awareness of the necessity of incorporating external costs into the accounting system remains low.

Sustainable development requires using external costs as a measure of efficiency of environmental protection activities, and as a foundation for establishing the goals and

policy instruments in this area (Graczyk, 2005). Internalisation of external costs increases the overall economic efficiency, in particular the efficiency of economy–environment interactions. Thanks to internalisation, environmental degradation, synonymous with limiting future development opportunities, becomes unprofitable.

Tool 1.T2. Internalisation of external costs

Charging those who cause external effects with the relevant costs (internalisation), forces them to look for opportunities to prevent or, at least, to minimise these effects. Those who cause them are best suited to limit them, as they know best their activities and the possibilities to change them so that externalities do not emerge. Forcing internalisation benefits the society that otherwise would have to bear the external costs. Below we list several examples of tools used to ensure internalisation of external costs related to environmental degradation, following the 'polluter pays principle' (see Barde, 1996; Fiedor, 2002, chapters 10–12; Kronenberg, 2007a, pp. 25–32).

Rarely do the tools used in the real world respond to the theoretical requirements for internalisation (Żylicz, 2004, pp. 65–66). In most cases, they do not take into account the real value of losses. Thus, they do not force polluters to cover full costs but rather discourage them from polluting further and motivate the prevention of external impacts in general.

Although most environmental policy instruments have a preventive character, the internalisation of external costs is most often associated with economic instruments. Influencing the costs and prices, they use market mechanisms, setting polluters back. However, expecting a given policy to reduce their profits, companies tend to inflate the costs of environmental protection, which leads to transaction costs related to implementing environmental protection policies (for example the costs of incentives for companies to provide reliable information). Thus, the process of calculating external costs and acquiring access to information possessed by polluters remains costly.

Taxes and charges

Taxes and charges levied on products and selected forms of activity are often treated as a price for using the environment. They make companies that pollute the environment less competitive than those that use ecosystem services more efficiently. Charges for the use of resources or polluting the environment provide good examples of how this mechanism works. Taxes and charges can also be used to make selected products more expensive for consumers, and their differentiation should result from the differences in external costs related to the production of those products. For example introducing charges on plastic bags in Ireland in March 2002 (0.15 euro per bag) resulted in a 90% decrease in bag consumption within two and a half years (Eurocommerce, 2004, p. 15).

Ecological fiscal reform

Ecological fiscal reform encompasses reforming the tax system by reducing income taxes combined with increasing consumption taxes. Often, additional compensation has to be paid to the consumers most affected by such a solution, especially less affluent households that have so far been consuming the cheapest and the most environmentally harmful products.

The other element of ecological fiscal reform, thus far the more frequently used, is removing environmentally harmful

subsidies (for example subsidies that increase fishing capacity in the fishing industry). Conversely, subsidies can be received by companies attempting to reduce the external costs of their activity. As we shall see in case study 1.C2 on cod fishing in the Baltic, to prevent negative externalities related to illegal fishing, and limiting the number of days which could be spent at sea by fishing vessels was accompanied by compensation paid to companies involved in the stoppage.

Non-compliance fees

Non-compliance fees have to be paid by companies that use the environment but do not have the relevant permissions or exceed the limits they have been granted. The main purpose of these fees is prevention and enforcing regulations. To a lesser degree, they also help to compensate for externalities.

Deposit fees

Consumer behaviour can be influenced by the use of deposit fees. A deposit paid by a consumer at the purchase of a product is returned, when the consumer returns the product to the original point of purchase or other qualified facility. These are probably best known in the area of packaging (in particular for drink containers), but have also been used for products such as refrigerators or cars.

Tradable permits

Tradable permits provide an example of an economic instrument, closely related to administrative instruments. They require setting a total permissible limit of the use of the environment (for example emissions of a given pollutant) and individual limits distributed between the polluters that participate in this scheme. The value of externalities is set within a system of market transactions between the polluters which are based on their individual costs of emission reduction. The best known examples of the use of this tool are the CO_2 emissions permits market introduced by the Kyoto Protocol and the related European Emission Trading System. In the United Kingdom, the possibility of extending such a system to individual citizens has also been under discussion.

Direct regulation

In spite of the increasing popularity of economic instruments, direct regulation remains widely used. Through administrative decisions, it limits activity that causes external costs. The limits most often refer to:

1. environmental quality standards (for example maximum concentration of sulphur in atmosphere);
2. emission standards, referring to maximum amounts of pollutants that can be emitted to the environment (for example permits setting the maximum amount and concentration of selected substances in wastewater let out by a given company);
3. technical standards requiring companies to use processes and equipment conforming to given parameters (for example required properties of the process of waste incineration); and
4. product standards referring to the properties of products (for example energy efficiency or eco-design).

In an extreme case, standards can take the form of bans or commands, such as bans on the use of certain substances in products, for example mercury in thermometers.

Voluntary agreements

Voluntary agreements between government and companies play an increasingly important role in environmental policy. They allow the reaching of the same goals that could be enforced through regulation but they let companies present this activity in a better light (fulfilling the objectives jointly set by the business and the government sounds better that

complying with regulation). They also ensure higher flexibility and they reduce the uncertainty of future regulation. To make companies obey these agreements, a threat can be introduced that in the case of non-compliance a direct regulation would be used (as it was the case in agreements on emission standards signed by the European Commission with car producers).

1.4. Ignorance

Ignorance or lack of detailed knowledge of economy–society–environment interactions is one of the main reasons for the occurrence of market failures. In spite of countless studies, these interactions remain poorly understood. Certainly, we now know more than we used to know 30 years ago, still this is not enough to make competent decisions regarding our impacts on the environment. Thus, 'the acceptance of our ignorance is a first step in creating a more rational approach to environmental policy' (Faber et al., 1992b, p. 93). Where we do not know something, adopting a more humble and precautionary attitude, combined with further studying of a problem, emerges as the most reasonable strategy. In this context, sustainable development requires systems thinking, alongside the principles of prevention and precaution.

The problem of ignorance relates to the specificity of the environment and to the limited human knowledge of the surrounding world. The environment is subject to constant evolution, as are economic processes (for example new substances and products) and their impacts on the environment. Increasing complexity of our activities affects the complexity of their environmental impacts. Even the value of externalities is subject to constant change. This results among other things, from the fact that consumer preferences are related to the use of a clean environment and their changing ethical convictions on environmental degradation and extinction of species.

Ignorance manifests itself at many levels: ordinary people unaware of the environmental consequences of their decisions; decision makers making decisions based on incomplete information or under pressure from different interest groups; and also experts who are not able to encompass the whole complexity of ecosystems and of the impacts that the economy might have on them. As many environmental problems are unpredictable, ignorance cannot be reduced to a calculable risk or uncertainty, particularly in the long term. The threshold and cumulative environmental effects in ecosystems provide a notable example.

Pollutants accumulate in nature and after reaching a certain concentration, a substance can cause drastic and irreversible changes in ecosystems. Restoring the former equilibrium state may require a disproportionately high effort as returning to the previous state requires reducing the pressure to a much lower level than that at which the change had occurred (because of threshold effects and retarded outcomes in relation to their causes). Thus, simply reducing the relative emissions level does not help, because it is the concentration (the absolute quantity) that matters for an ecosystem.

Although collecting data and studying economy–society–environment interactions as thoroughly as possible constitutes an important response to the problem of human ignorance, we shall not be able to completely overcome it.[7] Thus, economic processes

[7] For a detailed discussion of the role of ignorance from the perspective of sustainable development and science in general, see Faber et al. (1992a,b). They divided ignorance into closed ignorance (when we are not aware of it) and open ignorance (which we attempt to reduce). However, open ignorance encompasses both reducible and irreducible ignorance. The former can be reduced through research and science while the latter reflects the complexity of the world that surrounds us and the constant change within it, and it cannot be reduced.

should be studied with reference to their social and environmental impacts. As our knowledge progresses, some of the areas previously clouded by ignorance may become subject to uncertainty and ultimately quantifiable risk. Although we cannot reduce our dependence on the environment, we can shape our impacts so that we could use the environment in a sustainable manner. Sustainable development requires systems thinking (to which we return in the following chapter) and cooperation of experts from different areas. The integration of environmental issues into various sectoral policies is one of sustainability principles emphasised in many political declarations. In fact, the EU Sustainable Development Strategy requires that sustainable development becomes an overarching goal of all policies. Each new policy proposal should be evaluated from the perspective of its economic, social and environmental impacts, both within the EU and abroad. According to the Strategy, these assessments should include the externalities related to the realisation of new policies.

The precautionary principle provides an institutional framework that accommodates the problem of ignorance. It stipulates that environmental protection measures should be introduced as soon as possible, when the risk of environmental degradation appears. The EU established the precautionary principle as one of the tenets of its environmental policy, already in the Treaty of Maastricht in 1992. Since then, the precautionary principle has also been used in food safety, consumer protection and technological development policies. In 2000, the European Commission issued a communication on the precautionary principle where it outlined its understanding of the principle, and later also proposed guidelines for applying it. The EU has referred to these principles adopting radical steps that aimed at reducing health or environmental risks brought about by the use of different substances, for example endocrine disruptors (in 1999) and phthalates (in 2005).

The need for the use of the precautionary principle could be minimised by the wider adoption of waste and pollution prevention strategies. This approach contrasts with the so-called end-of-pipe solutions, such as reducing the burden of waste and pollution that have been created. Prevention is often associated with an integrated approach as to be effective it has to refer to the complex problems of environmental degradation and to the whole spectrum of business activities. Reducing inputs to an industrial processes, one automatically also reduces the outputs. In consequence, as we shall see in chapter 5, limiting resource use and efficient use of resources available is the most obvious form of adopting the preventive approach (figure 1.3).

Further research into economy–society–environment interactions, respecting systems thinking, and precautionary and prevention principles, is necessary for the realisation of sustainable development. Societies are constantly exposed to unexpected change in ecosystems and to their complexity. As the historical review in section 1.1 showed, in extreme cases, ignorance and the resultant lack of the responsive actions has led to the collapse of the whole civilisations. Ignorance is a limitation that even the best developed social capital will not be able to solve. However, it is building the social capital that constitutes probably the best answer to the problem of ignorance.

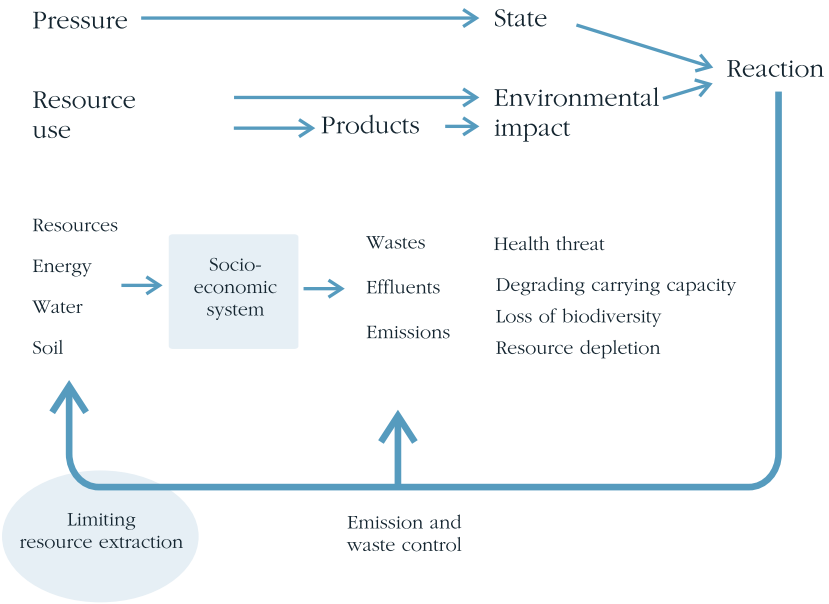


Figure 1.3. Limiting resource extraction as a waste and pollution prevention strategy (Bringezu, 2002, p. 199)

1.5. Institutions and social capital

The economy functions within a larger social system which includes not only households and companies but also all the institutions that people create. Institutions are responsible for setting and executing laws and policies, education, administration and other activities related to the functioning of a society, including its relations with the environment. Thus, institutions are also responsible for creating a framework for the internalisation of externalities and for limiting our ignorance of economy–society–environment interactions. Eventually, institutions act thanks to the social capital on interconnected human resources. The quality of social capital depends on mutual trust and relations within a society. Thus, social capital is the key to sustainable development, both as a regulator of the economy's impact on the environment and as a foundation for future development.

Environmental policy instruments aimed at the internalisation of externalities (tool 1.T2) and education provide examples of institutions created with sustainable development in mind. However, sometimes institutions fail to reach their objectives, which may result from the deficiencies of social capital. The examples of such failures include unsuitable government interventions and inefficient government in general, and stakeholder involvement failures (table 1.2). Some of these failures could be avoided had the society been more involved in all of the processes that might affect it. Such a civic society can be shaped with the use of relevant policies (increasing society's share in decision making, stimulating civic activity, and facilitating communication) and education (increasing the citizens' awareness of opportunities and benefits of their involvement). One of the most important aspects of civic society is citizens' participation in the planning of local development and in solving local conflicts (tool 1.T3; case study 1.C3).

Table 1.2. Institutional classification of failures and their environmental implications (Opschoor, 1996, pp. 334–338)

Type of failure		**Specific problems related to it**	
Government failure	Correction failure	Missing policies (environmental)	No relevant governmental policies or activities to prevent environmental degradation.
	Intervention failure	Environmental policy failure: – targeting failure (inadequate objectives); – instruments failure (quantitative, qualitative); and – entitlement failure Other policy failures (sectoral and macro-economic)	Inappropriate goals or no goals at all. Inappropriate instruments to achieve those goals. No mandate to act. No relevant reference in or to) other policies.
	Administrative failure	Integration failure (horizontal)	Improper administrative activities unable to solve environmental problems.
		Intervention level failure	
		Enforcement/implementation failure	
Empowerment failure	Social mobilisation failure	Missing/inadequate countervailing power	Within non-governmental sector, there is not enough mobilisation that would counteract against inappropriate governmental activities.
	Authorisation failure	Missing/inadequate remit/mandate	Stakeholders have no mandate to deal with Potentially environmentally harmful issues.

Developed social capital brings benefits to individual people (for example support from their friends and relatives) and to the society as a whole (for example efficient solving of social problems). One of the elements of social capital is trust which provides a foundation for cooperation and taking actions in the public interest. From the economic point of view, developed social capital reduces the costs of carrying out all activities aiming at public interest. Social awareness translates into better social control of economic activity which limits corruption, increases compliance with regulations, and forces the internalisation of externalities. Informal norms and customs that function within a society, combined with social control, complement regulations. Social capital is not only necessary for sustainable development it is its element, which we shall examine more closely in chapter 15.

Ultimately, the goal of sustainable development is to ensure a high quality of life (the ability to meet people's needs), for both present and future generations. Undertaking disinterested actions for others or for the public interest is one of the symptoms of a high

quality of life. However, this is not reflected in the widely used indicators of economic growth, sometimes mistaken for the indicators of well-being (see section 3.4). In Poland, the focus on material aspects of development is particularly evident. In 2007, only 11% of Poles belonged to any organisation: social, local government or political (for example, parent–teacher associations, trade unions, associations, clubs, the local parish, or political party, etc.). The level of trust in public institutions in Poland is also particularly low. In 2007, Poles trusted members of their families (83%), neighbours and friends (69%) and, to a much smaller extent, local authorities (26%) (CBOS, 2008).

The diagnosis of social capital in Poland (CBOS, 2008) suggests that it is necessary to support civic involvement, non-governmental organisations and local leaders. It is necessary to educate people on the relationship between the state of the environment and quality of life (see chapter 9) and on the possibilities of and reasons for undertaking social activity. These educational activities can often be undertaken by non-governmental organisations (NGOs) (see case study 14.C1). Finally, social involvement in solving environmental and social problems is also necessary and to make it possible, social consultations should more often be used to ensure that citizens take part in the decision making process.

Tool 1.T3.
Social participation

Social participation is the process of engaging all stakeholders in the resolution of local problems and decision making concerning matters important to the community. Its success depends on the quality of local social capital. Therefore, the activities leading to its development and aiming at the wide use of all local community members' potential (their knowledge about their needs, problems, specific local conditions, their experience and capacities) are crucial. The role of local authorities is to create the atmosphere supportive for the process of citizens' association. Social organisations facilitate communication of local authorities with inhabitants, they are a natural partner in initiating participatory processes. Although NGOs can voice the interests of the community in which they operate, they cannot be treated as their sole representative or spokesman (Kwiatkowski, 2003) but only as a broker between local government and its citizens.

Stakeholders' identification, defining issues to be resolved, as well as deciding on the division of responsibilities among diverse participants, is crucial to make the decision making process more participatory.

Stakeholder analysis is important in ensuring the presence of representatives of all important stakeholders, and also those that the initiators of the process see as opponents (for example connected to an opposing political group). It is also worth taking into account those individuals and organisations that are not strictly connected with the local community in question. This is particularly important in areas that are naturally valuable, where the activities related to the management of natural resources taken by inhabitants can influence also those citizens that do not seem directly to hold a stake. Often, their interests in the participatory processes are indirectly protected by environmental NGOs (Caldecott and Lutz, 1996). The presence of all stakeholders at the 'roundtable' alongside partnership-based rules of cooperation ensure that solutions that emerge are easier to accept by everybody.

It is advisable to initiate social activity by

taking on the agenda those issues that are most important to the community, the closest to their interests and as such connect and not divide stakeholders. Achieving success in solving these problems can lay the ground for a stronger acceptance of group decision making in the future, building trust and goodwill for cooperation that is necessary in dealing with potential conflicts.

Building groups that have a strong need for action around a burning problem is quite easy. However, the weakness of a process initiated in this way can be its impermanence because such groups often have difficulties in the access to material resources (to finance their activities, and expertise, etc.) and their existence often ends when the problem is resolved. The partnerships initiated by NGOs can be more durable in time, as those organisations possess experience in securing funding for their activities, and knowledge and experience in managing social processes. However, their activities can be treated with suspicion not only by the inhabitants (often such organisations are considered as 'outsiders') but also by local authorities that can feel threatened by the loss of power or in revealing their incompetence (Dębczyński, 2001).

In many cases, the initiator of cooperation is a local leader who has the skill to influence others with his or her passion and vision. The members of groups formed around such a person take on his or her enthusiasm and tend to voluntarily put in their work and time. A leader helps a group to reach its goals and keeps its coherence. However, he or she needs to have the ability to delegate power, responsibility and duties, because otherwise if the leader disappears the partnerships formed around him or her are at risk of falling apart.

The engagement of local authorities in the initiation of participatory processes can be very helpful. In contrary to the groups mentioned earlier, they have the financial resources that can support the process, and they can also provide regular work input from their employees. However, local authorities should treat other stakeholders as partners rather than as advisory bodies (Borys, 1998). The autocratic personality of those in power can be an important barrier in socialising the decision making process, as well as the history of relationships with the local community (e.g. existing conflicts) or a strong identification of local authorities with one of the political options. Those barriers have to be overcome by the trust built on effective communication. The access to information about the plans considered and possibilities of engagement, and not only about decisions actually being made, should be provided to citizens and other stakeholders (Kwiatkowski, 2003).

The main task of a local partnership is to create a vision for the community in the longer perspective (i.e. in 25–30 years). Thanks to the presence of a wide spectrum of stakeholders, this can reflect social needs and expectations beyond political divisions and diverse interests. Long-term vision ensures the continuity of the development policy of local authorities, making the dependence on the process of elections less important. Succeeding governments feel the obligation to keep up the directions of development that have wide social acceptance. At the same time, businesses and residents can plan their activities knowing what the future holds.

The success of a participatory process does not depend only on its outcome, such as a plan, strategy or a chosen solution. The process of finding agreement is of the same importance. It should be based on looking for consensus, which is the only win–win situation. The compromise that is traditionally used does not guarantee that the solutions chosen will not cause protests when they are implemented. To guarantee participants a feeling of justice related to the procedure, it is advisable to involve a qualified facilitator or a mediator from the outside. Such a person helps to achieve an

agreement on common rules, and supervises its implementation, taking care of the constructiveness of the process. He or she helps all stakeholders to have balanced influence on the process, is fully impartial (towards the parties) and neutral (towards solutions), supporting the group in reaching consensus, at the same time leaving it with the full control of the chosen solutions.

1.6. Summary and conclusions

The concept of sustainable development has significant practical importance as we have seen, based on the experience of societies that did not follow this path. Sustainable development requires the maintaining of social and environmental capital on which further development opportunities depend. Societies that abused their environment collapsed, irrespective of their previous significance. In our own case pressure on the environment exerted by modern society places the environment's ability to provide us with its indispensable services in doubt.

As a result of external costs (the costs which are not borne by those who cause them), prices do not reflect the real value of goods and services offered in the market. Thus, choices that buyers make may be inconsistent with their real preferences. Until external costs become internalised, such decisions may further worsen the problems of environmental degradation and the related long-term costs for society as a whole.

One of the reasons for which external costs are still internalised but only to a small degree is ignorance of economy–society–environment interactions. Although ignorance can be reduced thanks to our research and education, we are not able completely to eliminate it. In the following chapter, we refer to systems thinking thanks to which we can see a more comprehensive picture of our dependence on the environment and the ways to protect it for future generations. Sustainable development also requires the adoption of precautionary and prevention principles (refraining ourselves from undertaking potentially harmful activities and preventing problems before they appear).

A society that is more conscious and active will have an important role to play in sustainable development. On the one hand, it is a tool that can help to implement sustainability (as a regulator of the economy's impact on the environment). On the other hand, the state of social capital determines the character of development (high-quality social capital ensures the continuity of the vision for development and planning for its realisation). Sustainable development necessitates educating and involving society in decision making, including within the areas of environmental management and conflict resolution.

The character of sustainable development is reflected in figure 1.4. It presents a pyramid inside which there is a second pyramid. The smaller of the two depicts a common, and narrow understanding of development as using intermediate means (from the perspective of sustainable development) which leads to the realisation of intermediate goals only. Sustainable development needs to be treated more broadly so that to produce intermediate means (man-made capital), we need ultimate means originating from the environment (natural capital); and intermediate ends (social capital) that can be used to realise the ultimate ends synonymous with well-being.

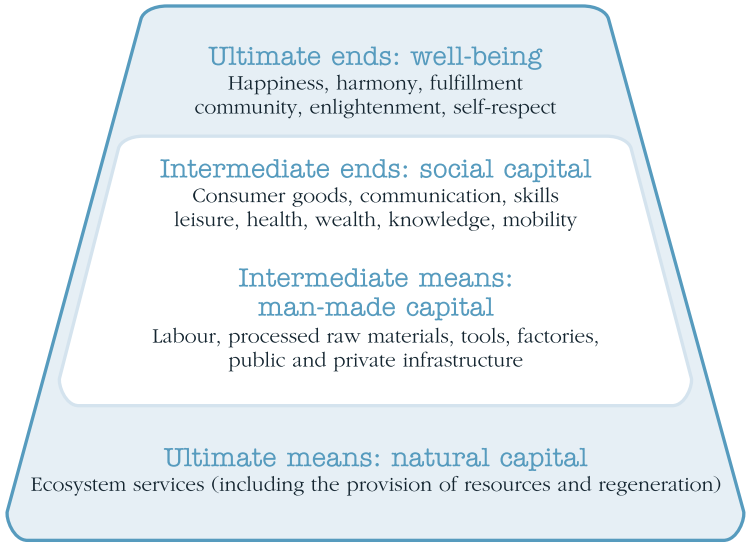


Figure 1.4. Sustainable development pyramid (adapted from Daly, 1973, p. 8; Meadows, 1998, pp. 41–43)

Practical resources

<www.externe.info> a methodology of estimating external costs developed within the ExternE project.

Champ, P.A., Boyle, K.J., Brown, T.C. (2004), *A primer on nonmarket valuation*, Dordrecht: Kluwer. One of the most elementary books on non-market valuation methods.

Szczepanowska, H.B. (2008), *Wycena wartości drzew na terenach zurbanizowanych*, Warsaw: Instytut Gospodarki Przestrzennej i Mieszkalnictwa. The first of a series of 6 books on the valuation of trees in Polish cities.

<www.ecosystemvaluation.org> a website on the valuation of ecosystem services, prepared for non-economists, written in an accessible language.

<www.evri.ca> *Environmental Valuation Reference Inventory* a database of ecosystem services valuation projects.

<www.co-intelligence.org> the Co-Intelligence Institute's website provides resources on methods, models and theoretical frameworks related to collective activities undertaken 'in tune with each other and with nature'.

<www.deliberative-democracy.net> the Deliberative Democracy Consortium website offers many tools, such as the Democracy Helpline, the purpose of which is to empower local communities and citizens in developing participatory decision making processes.

ISIS method (*Indicators, Systems, Innovation, Strategy*) developed by Alan AtKisson and colleagues in the 1990s (see AtKisson, 2008), supporting planning and realisation of sustainable development projects. It incorporates selecting indicators, systems thinking, introducing critical changes (using the so-called leverage points) and formulating a strategy or a development plan, based on all previous elements. The use of the ISIS method can be supported with a number of tools that have been developed conjointly with it. In Poland, two organisations are licensed to use this method: the Sendzimir Foundation and the Centre for Systems Solutions.

Questions

1. Which ecosystem services do we use most often as consumers, and which – more generally, as people?
2. Give examples of goods that mostly have a use value for yourself. Then think of other goods that mostly have a non-use value.
3. Give examples of different uses of cost–benefit analysis of changes in the provision of ecosystem services.
4. Give examples of non-market goods and discuss which of the methods presented in tool 1.T1 would be the best to value them.
5. For an ecosystem service of your choice, discuss which attributes could be used to describe it.
6. If external costs of road transport are significantly higher then external costs of rail transport, then how do we explain the fact that road transport wins the competition with rail transport in the Polish market?
7. Give examples of external costs related to electricity generation using different sources of energy.
8. What institutions play the most important role from the perspective of sustainable development? What is their quality in your country?
9. Why is sustainable development treated as an important condition for different forms of financial aid (for example projects funded with European funds, international development aid, preambles of different national, EU and international documents)? What practical significance does this condition have for those who introduce it?

Case study 1.C1.
What is the Białowieża Forest worth?

One of the most widely recognised and ecologically valuable forests in Poland is the Białowieża Forest which, despite some visible signs of human activity, is still commonly considered the last natural lowland forest in temperate Europe. It is especially well regarded for its natural dynamics alongside its species richness, and its ecological structures and functions. Currently, national park status applies to roughly 16% of the area of the Białowieża Forest, despite a 20-year struggle by environmental activists to extend it to the entire area of the forest. There seems to be a tradeoff between using it by forestry industries and conserving it, thus improving biodiversity and possibilities for recreation. The question is what is the most efficient use of the forest? In other words, what management regime generates a higher value to society?

Revenues from 110–150 thousand m^3 of timber extracted annually from the Białowieża Forest are at the level of 3.5–5 million zlotys (PLN). This is only one of the possible sources of welfare that the Białowieża Forest generates. Another is recreation and it is possible to estimate the value of this using revealed preference methods.

The Białowieża Forest is visited by 110,000 tourists every year. By employing the travel cost method, it is possible to estimate what the Białowieża Forest is worth to them. Following data collected by Kalinka (2003), Giergiczny (2009) estimated the demand function for recreation in the Białowieża Forest.

Kalinka interviewed 584 visitors to the Białowieża Forest. He collected data on their means of transport, distance travelled, journey times and socio-demographical data. Based on this data, it was possible to construct a model which explained number of visits based on numerous explanatory variables including cost. By simulating different cost levels, Giergiczny was able to estimate the average consumer's surplus[8] from a visit to the Białowieża Forest to be about 100 zlotys. Provided that each year 110,000 tourists visit the forest this amounts to roughly 11 million zlotys a year. This is the least how much the Białowieża Forest is worth for its recreational purposes.

11 million zlotys is almost 2.5 times more that the value of the timber extracted from the Białowieża Forest. However, it is not enough to say, that logging in the Białowieża Forest should stop in order to increase its recreation value, because one would need to know if logging interrupts recreation in the forest. It is possible that if the entire area of the forest was protected (i.e. with no logging) the increased welfare of visitors would exceed forgone revenues from timber. However, it is also possible that recreation and logging can coexist without much interference. There is however, yet another aspect to consider.

Economists agree that consumers may derive satisfaction (or as economists say, utility) from some goods, even if they are not directly using them. This type of value is called *non-use value*. For example, consumers may be deriving utility from the fact that the blue whale is protected even if they never expect to see one. Since consumers are better-off if the whales are protected, they would be willing to pay for their protection. The same mechanism applies to utility from knowing that a forest is protected, even if a person would never go there. This also illustrates why people may be willing to pay for environmental reserves, even if they will never be able to visit them.

In order to estimate both use and non-use value of increased protection of the

[8] Monetary equivalent of the satisfaction that a consumer gets from visiting the Białowieża Forest.

Białowieża Forest, stated-preference methods have to be used. Czajkowski et al. (2009) conducted a survey which valued increased biodiversity in the Białowieża forest resulting from higher levels of protection.

Biodiversity is generally defined as variability among living organisms, and the ecological complexes of which they form a part. This includes diversity within species, between species and between and within ecosystems. Biodiversity is important on many grounds in that it plays a critical role in sustainable development and poverty eradication, and is important to human well-being, livelihoods and cultural integrity. Biodiversity is also recognised as underpinning the functioning of ecosystems by maintaining flows of ecosystem services, and playing an important role in maintaining ecosystem resilience to exogenous shocks, such as extreme weather events. Finally, biodiversity is also valued in and of itself, as a direct source of utility (rewards from the contemplation or hunting of wildlife), and as something of cultural and spiritual importance.

There have been many attempts both to conceptualise and value biodiversity in economic terms. However, economists face two major problems in assigning values to changes in biodiversity. Firstly, there exists a large range of quantifiable indicators of biodiversity and it is not obvious which is best to focus on. For example, biodiversity can be described in terms of the number of species or ecosystems, their distribution and differences in their functional traits. Secondly, many of the 'best' indicators from an ecologist's perspective may be not understandable to the general public whose values are relevant to cost–benefit analysis.

Czajkowski et al. (2009) brought a number of aspects of biodiversity considered important by ecologists into an economic valuation context, through the use of the choice experiment method.

Some authors suggest that the highest priority from a policy perspective should be the protection of all forms of biological variability within the Białowieża Forest, including landscape, habitats and their components, species, as well as biological and ecological processes. Such a policy would allow for long-term observation of flora dynamics, succession and regression, fluctuation, degeneration and regeneration, as well as seasonal changes. Most transformed and actively-managed temperate forests in Poland and elsewhere in Europe do not allow for observations of all the above processes, which makes the Białowieża Forest unique. Almost 40% of currently known species present in Poland (over 11,000) can be found in the Białowieża Forest[9] and it is estimated that many species are still undiscovered. The Forest's habitats are characterised by the presence of a large volume of dead wood, so that many endangered species dependent on this are still present. One of the flagship endangered species that exists here is the European Bison (żubr) whereby the Białowieża Forest has played an important role in its recovery.

The authors identified biodiversity attributes based on ecological knowledge and research results, collected from the study site over the last 50 years. A careful process of pretesting allowed for the valuation study to incorporate this information into the valuation of changes in forest biodiversity. Through a careful process of pretesting and focus groups, candidate attributes were merged and finally narrowed down to three most important ones and, additionally, a cost attribute. The three selected attributes represented potential changes in forest biodiversity and at the same time were understandable to respondents.

[9] The area of Białowieża Forest is roughly 62,000 ha, what accounts for only 0.02% of the territory of Poland.

The first attribute described as *natural ecological processes* represented the natural dynamics of the Białowieża Forest. The dynamics of these natural processes allows for unique scientific observations of biodiversity changes in Białowieża Forest and their meaning for ecosystem functioning and resilience. According to specialists, and as explained in the questionnaire, the improvement in this attribute could be achieved by passive protection of a given percentage of the total area of the forest. A passive protection would mean leaving the ecosystem without any human intervention, such as cutting and removing selected trees, recreating selected biotopes or influencing animal populations in any way, even if this resulted in (natural) changes in ecosystems. The three levels set for this attribute were: *status quo* at 16% of the area to be passively protected, *partial improvement* at 30%, and *substantial improvement* at 60%.

Rare species of fauna and flora represented the second attribute. It was highlighted in the questionnaire that this attribute represents not only known, but also yet-unknown species. Examples of both flagship and lesser-known species were given together with information on their reliance on active protection activities, such as controlling animal species populations, feeding or reproduction programmes. A short general explanation of the importance of different species to the ecosystem was also provided. The levels of this attribute were: *status quo* as a decline threatening total extinction of some species, and *improvement* as actions to maintain the current populations and improvement of their quality.

Ecosystem components was the attribute characterising the existence of biotopes and ecological niches, such as dead wood, natural ponds, streams and forest clearings. It was explained in the questionnaire that improvements in this attribute could be achieved by active protection of these components. This attribute could be important for respondents both for the existence of the components alone, as well as being a proxy for improved well-being of species inhabiting the forest. The possible levels of this attribute were: status quo as an absence of some components and decreasing quality of existing ones, *minor improvement* as regeneration of deteriorated components on 10% of the area, *partial improvement* on 30%, and *substantial improvement* on 60% of the area.

In all cases, the biodiversity attribute levels, including the status quo, were based on the present state of the Białowieża Forest and possible changes of the management regime considered by policymakers and environmentalists. The final, fourth attribute was cost, representing an increase in a compulsory tax to be paid over 10 years. Including a monetary attribute allows for expressing tradeoffs that respondents make in monetary units and using the results for example in cost–benefit analyses.

The questionnaire was administered face-to-face to a representative sample of 400 adult Poles. It consisted of general information about the Białowieża Forest, its current situation and problems, a detailed description of attributes, their possible levels and their meaning for ecosystem health, socio-demographic and environmental attitude questions. The survey was accompanied by a set of auxiliary cards with diagrams and pictures shown to respondents, as illustrative of the problems discussed and to enable better understanding of possible policy options.

The respondents were presented with generic choice-sets and asked to choose the alternative they prefer the most. Based on the statistical analysis of the data collected in this way, it was possible to say how important different attributes are to a representative Pole and how much would he or she be willing to pay to increase protection of the Białowieża Forest.

Average willingness to pay for preserving natural processes (15 and 20 zlotys/household/year for partial and substantial improvement respectively) was close to the willingness to pay for better protection of ecosystem components (14, 15 and 20 zlotys respectively) and higher than willingness to pay for better protection of endangered species (11 zlotys). This indicates, that the respondents placed, on average, higher value on the *passive protection* of ecosystem processes than the active protection of endangered species.

It is possible to calculate the monetary equivalent of the welfare gain associated with a change in protection policy in the Bialowieża Forest. The predicted change in mean welfare per household per year in Poland is equivalent to 70 zlotys. Since there are roughly 12 million households in Poland the change in protection policy would result in a welfare increase of 840 million zlotys a year.

The 840 million zlotys a year probably includes the use (recreation) value of the Białowieża Forest, as some of the respondents might have been willing to pay for increased protection of the forest because it provided a better possibility of recreation for them. Nonetheless, this number is much higher than current revenues from logging (3.5–5 million zlotys). Thus, it is safe to conclude that Polish society would benefit from a change in a way the Białowieża Forest is managed i.e. from the current mix of protection and industry use to increased protection and conserving what is the last natural lowland forest in temperate Europe.

This case study illustrates how economic arguments and non-market valuation methods can help to make efficient policy decisions with regard to environmental goods. Economic valuation studies, such as this one, allow estimation of the value of changes in environmental goods in Poland. The estimated values can be compared with alternative uses of these resources i.e. the value of environmental improvements which can be compared with the cost of providing them and the value of environmental losses either with private or public benefits of the investments that influence the state of the environment.

Questions

1. What other valuation methods could be used to estimate the value of the Białowieża Forest? What would be the advantages and disadvantages of using them?
2. How can valuation results be used for the protection of the valued ecosystem? What are the opportunities and threats related to the use of these tools?

Case study 1.C2.
Cod fishing in the Baltic

Several fisheries experienced spectacular collapses, such as the herring fishery of the North Sea and the cod fishery in the north-west Atlantic (Jonzén et al., 2002; Karnicki et al., 2008). Resources had seemed to be plentiful, with catches constantly increasing until suddenly they collapsed, and eventually falling to zero. This was not foreseen either by scientists or by the decision makers responsible for fishing management.

Marine fisheries are listed among those ecosystem services that are under highest pressure from the economy. World catches of fish were growing in the post-war period, reaching their maximum towards the end of the 1980s, and since then have been in decline. Increasingly often, smaller, less preferred species and smaller fish of each species are caught instead of the most preferred ones. When best known fisheries collapse, and with technological progress, fishing fleets move to areas where exploitation has not been profitable so far (Hassan et al., 2005). According to the FAO (2009, p. 7), in 2007, 28% of marine fisheries were overexploited to varying degrees (19% overexploited; 8% after a complete collapse; and 1% recovering after a collapse), and thus not providing the amount of fish that they could have had they been managed sustainably. 52% of fisheries were fully exploited by providing the maximum amount of fish that they could. 20% were moderately exploited or underexploited and could probably provide still more fish.

The cod population in the Baltic

The Baltic cod fishery belongs to the overexploited category (Kuikka et al., 1999; Jonzén et al., 2002), yet cod is still one of the three most important species fished in this sea (beside herring and sprat). As in the case of other fisheries, decision makers here act with incomplete information (aka ignorance). However, they were provided with warnings by marine scientists who cautioned that the eastern Baltic cod population is threatened with extinction with the western one providing far less catches than it might, had it been managed sustainably.[10] Scientists called for taking resolute measures that would allow for sustainable fishery management in the long run. As in the case of other fisheries, cod catches in the Baltic suffered from a decline towards the end of the 1980s: in total they fell from 441,500 tons in 1984 to 72,000 tons in 1993, while catches in the eastern part fell in these years from 392,000 tons to 50,700 tons (Blady and Netzel, 2005; ICES, 2009; figure 1.5).

The above situation results principally from excessive exploitation, including considerable illegal fishing.[11] Excessive exploitation is linked to the overgrowth of fishing capacity (number of vessels and their equipment allowing for more effective location of fish and fishing). The pressure on exploitation has also been inflated by the short-term approach of fishermen, not taking into account whether fishing would still be possible in the future. As a result of lowering the population's biomass and its rejuvenation, fish are caught that have not yet been able to spawn. Furthermore, the situation in the Baltic demonstrates that we cannot consider one ecosystem service (providing cod in this case) without also making reference to other ecosystem services and processes (see figure 2.8 in section 2.3). Effective management of cod fisheries requires taking into consideration

[10] Both populations differ in size and natural features. The border between them runs through Bornholm.
[11] Karnicki et al. (2008) reviewed major problems affecting the Baltic cod population.

the changes introduced to the marine ecosystem by human activity, including pollution and fishing of other species, and natural changes, such as the frequency of brackish and oxygenated water exchange between the North Sea and the Baltic. Irregular water exchange and increasing temperatures of water make it even more difficult for a weakened population to regenerate. These interdependencies demonstrated the need for systems thinking, that is on the ecosystem as a whole and about economy–society–environment interactions. Eventually, excessive and illegal fishing can be blamed on institutional failures, in particular poor execution of solutions developed to manage a fishery. Poland along with Denmark and Sweden, are major over exploiters of the eastern Baltic cod population, and in this case the resultant problems have been particularly evident.

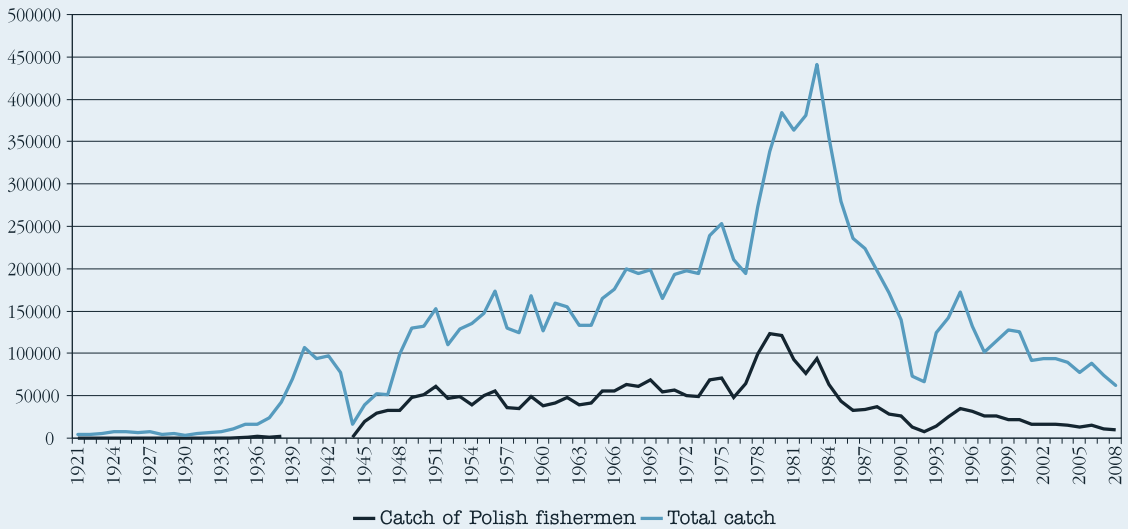


Figure 1.5. Cod catches in the Baltic, 1921–2008, total amount of fish caught and the amount caught by Polish fishermen (Blady and Netzel, 2005 – until 2003; ICES, 2009 – after 2003)

Attempts to improve the situation

The attempts to improve the situation facing cod in the Baltic were made by the International Baltic Sea Fishery Commission (IBSFC), and mainly by the European Commission (EC). As a member of the IBSFC, the European Union often initiated the actions of this organisation, and took over its role when the IBSFC was dissolved in 2006. The EC runs similar activities also in other fisheries, under its Common Fisheries Policy (CFP). Decisions regarding fisheries are made based on scientific research, carried out principally by the International Council for the Exploration of the Sea (ICES) and the Scientific, Technical and Economic Committee for Fisheries (STECF) established within the EU institutional structure. One of the important requirements of the CFP is applying the precautionary principle to the protection and maintenance of resources, as introduced by EC regulation 2371/2002.

For the purpose of the Baltic cod management, different plans and strategies have been issued, invoking different legal, economic and technical instruments (in 1999 and 2003 such strategies were issued by the IBSFC and in 2006 by the EC). Fishing limits (or total allowable catches, TAC) have been the main instrument in use since 1977 (with a break between 1982 and 1988), supported by closed seasons and areas, limiting the

number of days which vessels can spend at sea, and technical standards aiming at higher selectivity of fishing (for example. minimum mesh size or special types of nets). Since the 1990s, and in the case of Poland since 2004, economic instruments aimed at reducing the fishing capacity have also played an important role (compensation for days without fishing and severance payments related to permanent withdrawals).

The 2006 EC's strategy was eventually adopted as regulation 1098/2007, in force since 2008. It assumed constant reductions of fishing capacity (mainly through limiting the number of days which vessels can spend at sea) and the so-called fishing mortality (the rate at which fish are being removed from the stock by fishing). The number of days to be spent at sea might be increased for a given country if its fishing capacity were to be reduced otherwise (for example through permanent withdrawals). Also, the regulation introduced tighter fishing controls. In the opinion of ICES (2009), the EU strategy conforms to the precautionary principle and should lead to the recovery of the full reproductive capacity of the eastern Baltic cod population by 2015. The current actions intend to rebuild the Baltic cod stock so that a maximum sustainable yield will be possible in the future (catching the maximum quantity of fish that would not disturb the ecosystem's ability to provide a similar quantity in the next period). After reaching the maximum biomass, fishing mortality should not exceed the population's regeneration rate. This would ensure the maximum long-term economic benefits, and consequently sustainable development.

The instruments used for cod management result from negotiations between scientific advisors and the fishing industry. The former represents the long-term approach, while the latter focuses on short-term benefits. This conflict of interest is particularly visible in the case of the annual TAC negotiations which are always long and fraught, and as a result of which the TAC are set at levels higher than those recommended by scientists. However, once the TAC are set, they cannot be subject to further negotiation and have to be obeyed, which has been painfully realised by the Polish government and its fishermen. Although they had known of the TAC and other instruments aimed at the protection of cod stocks, they eventually had to be forced to obey them only when Poland joined the EU in 2004 and was subordinated to the CFP.

EU membership also created new opportunities, such as compensation and severance payments related to permanent withdrawals. As a result, in 2004–2006, 366 Polish fishing vessels were withdrawn (representing 29% of vessels and 40% of tonnage). Although in 2007 only 24 further vessels were removed, there is still significant interest in this opportunity. Scrapping vessels is accompanied by severance payments for laid off fishermen, at up to 10,000 euro per person.[12] Reducing the number of vessels translated into the relative increase of TAC for those vessels that remained in operation, thus also increasing the profitability for the fishing industry.

Positions and activities of Polish stakeholders

In spite of the above circumstances, since the onset of Polish membership in the EU, Polish fishermen suggested that reduced TAC would make fishing unprofitable and decided to breach it. In 2005, almost 500 vessels breached the fishing ban during the closed season (since the 1st of May). According to media reports, 95% of fishermen voted to break the ban in an internal referendum. They were supported by the processing industry associations, media and many Polish politicians. The fishing community was protesting against scientists'

[12] Compensation for scrapping vessels and severance payments raised the biggest interest among fishermen and in the EU budgetary perspective 2004–2006 the funds available for this purpose were used to the largest extent. Meanwhile, funds available for the protection and regeneration of marine resources were used to the smallest extent (only 0.5% of funds available were used).

reports and the TAC that were based on them, claiming that there was 'a lot' of cod in the Baltic. They also disputed the compensation payments (and their value) for refraining from fishing, which were not prepared in time by the ministry. In Gdynia, a meeting was organised with EU commissioner for fisheries and maritime affairs, who to no avail attempted to convince the fishermen that protecting cod lay in their own long-term interest. In spite of the fact that compensation payments were ready to be made, even after the closed season, only 1/5 of fishermen obeyed the extended fishing ban.

The fishermen's protests and illegal actions were complemented with Polish government's declarations that it would insist on the EC shortening the closed season to two months and press for a higher TAC for 2006. The same claims were made by Polish officials in the following years, questioning reports prepared by Polish and foreign scientists on which the EC's decisions were based. According to minimum estimates by ICES (2009, p. 31), in 2000–2006 illegal catches constituted at least 30–40% of official fish landings, which to a large extent was the result of Polish fishermen.

In 2007, the EC forbade Polish fishermen to fish after the closed season (01.07–31.08) because they had exceeded their TAC three times already before the closed season started. In response, the minister (representing the then Ministry of Marine Economy) publicly disparaged the EC fishing bans and announced that 'he would not do anything to make the fishermen stop fishing'. Although Polish decision makers were aware of the risks of such activities for the fishermen and for Poland (for example complete fishing ban in the following year or stopping the EU financial assistance for the Polish fishing industry), this policy was maintained even when most fishermen already realised that obeying EC decisions was necessary. In September, the then prime minister, together with a new minister of marine economy, declared that he was 'very firmly' fighting for a change of the EC's decision regarding the extension of the fishing ban in the eastern Baltic. Eventually, the government lodged a complaint against the EC's decision through the European Court of Justice (ECJ).

Illegal fishing takes place until it is profitable. Thus, the only way to eliminate it is to raise the costs of such an activity (OECD, 2005). In practice, this means the need for internalisation of externalities caused by those who practice illegal fishing. In normal conditions, they run the risk of additional costs (to avoid being caught, to corrupting public officers, and loosing their reputation). However, in Polish conditions, where those who breached regulations were supported by national authorities and where a significant proportion of fishermen declared they were doing so, they were not exposed to such risks. Potentially, the processing industry, trade and consumers also had an important role to play in preventing illegal fishing, as they could refuse to buy cod of unofficial origin (see chapters 7 and 14). For this purpose, an informational and educational campaign would be necessary (which might be co-organised by NGOs; see case study 14.C1), and a system of identification of fishing products (such a system is being elaborated in the EU; see subsection 7.3.3). Nevertheless, these steps were not possible in Poland until the positions of major stakeholders had changed.

Change of the Polish stakeholders' positions

The change of government in November 2007 brought about an improvement in the management of cod stocks. The new government withdrew the complaint lodged at the ECJ before it was examined. The penal restriction of the TAC (linked to the 2007 excess fishing) was divided into the following four years. Although in 2008 fishing was also prematurely closed because of the use of the TAC (fishing was not possible from 22 May

to the end of the year), and the majority of fishermen obeyed the rules. This resulted from tighter controls by the EC, linked to the implementation of regulation 1098/2007 and the 28 March 2007 declaration on combating unreported cod fishing in the Baltic Sea and signed by the European commissioner and relevant ministers of the Baltic countries. Effectively in 2008, the illegal catch was estimated at 6% of official landings (ICES, 2009, p. 31). Cod populations increased, as a result the EC agreed to raise the TAC for eastern Baltic by 15% (for 2009 and 2010). This time, the Polish fishing administration cooperated with the EC and with the fishing industry in establishing a new system of distribution of the TAC between individual vessels, and in creating a new, more restrictive system of control for obeying the regulations by fishermen.

Why was managing cod stocks in Poland so difficult?, especially when information about cod population and the threats that it was facing were available, and when the institutional framework for managing these stocks was well developed within the EU. Most probably, this was due to the possibility of practicing illegal fishing (and to shift the burden of the external costs to future generations of fishermen) that led to this situation. When fishermen breaching the regulations were supported by Polish government, the institution that is normally responsible for long-term management of resources and protecting the public interest at the national level was missing. Indeed, no national institution protected the long-term interests of the fishermen alone at that time (after all, 'without fish there would be no fishermen'). The low level of awareness of sustainable development mechanisms was also reflected by the fact that fishermen breaching the regulations were often supported by the media, and that there was no social pressure to change this situation.

In summary, the example of Polish cod fishing in the Baltic illustrates the complexity and interdependence of economic, social and environmental goals. The presence of cod is indispensable for the existence of the fishing industry in the future, and the profits of this industry depend on how it will manage the resource that it uses. The decline in catch levels in the second half of the 1980s reflected the scale of ignorance of decision makers and their advisors, and thus justified adopting a precautionary approach. Inadequate doses of precaution resulted from the impotence of institutions that were entrusted with cod management, and the fear of the social problems that might emerge had employment in the fishing industry been reduced. Therefore to change the situation, education and raising the social awareness of the abovementioned problems was necessary. Only then can decisions be made in a more competent manner. This also requires that fishermen are provided with the relevant training so that they have an opportunity to change their profession and find a new job outside of the fishing industry. Strengthening institutions and gradual improvement of fishermen's awareness, with the support the EU, have brought the expected outcomes and in 2008–2009 the situation had improved. Sustainable development required supporting the fishermen and the related economic sectors when to let the environment regenerate a resource it was necessary to limit the fishing capacity. Thanks to such efforts, the fishing industry is set to provide larger profits in the future.

Questions

1. Why were Polish fishermen and authorities against limiting cod fishing in the Baltic?
2. What made them change their position?
3. Based on this case study, how do you assess the quality of the Polish fishermen's social capital? To answer this question, refer to section 15.3.

Case study 1.C3.
A chipboard factory, a local community and the environment[13]

The history of this chipboard enterprise dates back to the mid-1960s when, in the town which today has 40 thousand inhabitants, a chipboard factory was opened. The location was chosen because of the abundance of raw material necessary for the production. After 1989, the enterprise underwent a series of ownership changes. Local authorities actively participated in the search for investors, keeping in mind protection of jobs provided by the company. However, the possible detrimental effects to the environment and health of the inhabitants related to production and its development were ignored. The problem of detrimental effects was not negotiated between the authorities and the company. Finally, the factory became a limited company and owned by a foreign investor, in this case a multinational group.

Relations between the town and the factory to date had resulted in a perception that ignored detrimental effects, initially assumed by local authorities are now evaluated critically. As one member of the local authority stated: 'taking into account the functioning of such a factory in today's realities in terms of its impact to the environment and inhabitants of the town… back in 1989 it all should have been pulled down, ploughed up and forgotten. However, this was a period when we all relished foreign capital and investment, basically all these things we speak of today (environment and health protection)… as the main issues, practically speaking did not exist then'. What has made this perception change so completely? And what experience led to such a bitter summary? Below, we briefly analyse the mutual relations between the town and the factory as it progressed through its several stages.

Three stages of relations between the town and the factory

During the first stage the local authorities, for the sake of economic development and job security, defended the company from residents who were unhappy with the increasingly detrimental effects of the company's operation. These effects included: dust emissions (both fine dust, inhaled from the air, and courser that formed deposits and destroyed surfaces ranging from window panes, car bodies, and laundry), odorous emissions, wastewater into the lake and soil, noise caused by machinery and transport of materials to and from the factory.

The second stage was initiated through local elections (1994) which saw a significant increase of local authorities' sensitivity to resident's opinions. Since then, the issue of detrimental effects caused by the factory became an indispensable part of the political life of the town. The authorities started to pressure the factory to minimise its detrimental effects while the factory completely ignored increasing social discontent. This stage of mutual relations is characterised more or less by open conflict was and a lack of a balance of power between the parties. According to initial expectations, the factory ensured jobs, attracted other investors from the industry, but at the same time formed a characteristic economic monoculture which took the town a hostage. This dependence caused both the authorities and the residents to avoid a full confrontation as they feared that the company might move production to other, cheaper, locations, for example Belarus or Ukraine. Actually, the company management representatives

[13] This case study is based on empirical data collected during a project no. N11601432/1304 'Instytucjonalne uwarunkowania społecznej odpowiedzialności przedsiębiorstw' (Institutional factors affecting corporate social responsibility) financed by the Polish Ministry of Science and Higher Education, carried out in 2007–2010. All company and place names have been removed due to confidential nature of the data.

stoked these fears whenever the conflict exacerbated. The conflict was not publicised outside the local media and the main defence strategy of the town was to notify control institutions. This proved to be ineffective, in terms of imposed and revoked fines for infringement of environmental protection regulations and construction laws, requiring removal of detrimental effects but never enforced and unable to censure the offender for the damages reported. The helplessness of the local community and failure of institutions to enforce the law contributed to the general sense of lack of control which resulted in the impunity of the company and lack of trust in the local community for government institutions, including provisions of law supposed to regulate pollution.

The first signs that the third stage had began were a thaw in relations when the company undertook actions to minimise their detrimental effects on the environment which occurred in the years preceding Polish accession to the EU. At the same time, the town gained a new means to exert pressure on the company as it planned to establish a special economic zone. The company expected increased effectiveness of control institutions (as a result of accession to the EU) and, what followed was the partial internalisation of external costs. Cost reduction expected from being in a special economic zone was naturally in the company's best interest. Within a few years the company improved water and waste management, modernised its machinery (after the old ones were damaged in a fire), installed electrofilters, and started to cooperate with the authorities in restoring the lake by which the town is located. Most of these actions, particularly related to water and waste, which resulted from the need to comply with the regulations in force and the orders imposed by control institutions. However, these actions did not completely remove detrimental effects on the environment and health. Among the town's residents the common opinion was that the factory's existence was a necessary evil, proved by an addage that 'either you have no job, or you have a little stench', or more bluntly 'to do away with this factory would be worse than any ecological disaster'. In other words, the inhabitants accepted ecological and health risks for the sake of minimising their economic risk, and give up their interest in quality of life (recreation, and living in unpolluted environment) for the sake of material security.

In recent years, local authorities strove to resolve this conflict by attempting to overcome the economic monoculture resulting from the company's development and attempts were made to develop tourism. This only revealed a peculiar trap in which the town was caught. Development of tourism needed access to a resource which was degraded by the company. This resource was an environment suitable for recreation, including: clean air (free from dust and odour), clean lake water (free from chemicals), silence (space free from noise originating from production and transport). As one of local authorities' representatives said: 'presence of such a factory does not facilitate building an image of a green town with a clean lake'. Moreover, this situation creates a characteristic conflict with a polluter' and exposing the issue, although a useful tool to activate social opposition, may be an obstacle to the material wealth of the community. Publishing information on lung and eye disease have been blamed on the pollution emitted by the factory was not a useful strategy that would attract tourists to this otherwise beautiful region. This discussion indicates that initial consent of the local authorities for unlimited development of the factory had consequences not only to the social and ecological systems but also to the economic one. The cost of creating new sources of income for the community from new branches of economic activity was a long-term goal that was not taken into account.

Lack of social participation

In the analysis of this case, one cannot see any use of social participation tools in local development planning. None of the stages of company–community relations involved the community in clear mechanisms for choosing the most suitable solution. In the surveys conducted, there was a dominant general opinion of no real alternatives, such as either a clean environment or jobs. Neither in the early 1990s, when strategic decisions concerning local development policy were made, nor later, did the community work out a common vision of the town and its surroundings from a long-term perspective. If they had, they could have enabled local community representatives to evaluate alternative development scenarios and decide which option was the best for the community. Despite the fact that decisions were made years ago they have limited the array of possible options to include the local community in their 'little homeland' development planning process which could have helped them devise win–win solutions.

Principle 10 of the Rio de Janeiro Declaration on Environment and Development states that 'environmental issues are best handled with the participation of all citizens concerned, at the relevant level'. This is accompanied by an assumption that the more opinions are taken into account, the more that aspects of a given issue will be considered for long-lasting solutions. Public participation ensures that the interest of parties impacted by decisions are taken into account. In the case above, not all stakeholders took part in the decision making processes, those decisions that were made were not even subject to public consultations. One may is tempted to state that this contributed to limiting available alternatives and a short-sightedness of accepted solutions. Yet, the decisions were made under specific conditions of economic transformation which produced general insecurity due to market instability, growing unemployment rates, low availability of investment capital, and a poor economy for local people. At the same time, ensuring economic stability was a priority over other values, such as quality of life, clean environment, and even ecological safety. As expressed by the German sociologist Ulrich Beck (2002), impoverished societies focus on production of wealth and repress the social perception of risk as they face the directness of their poverty.

This poses a question, how willingly would the local community adopt a long-term perspective that recognises ecological, health, and economic risks related to factory operation. Adopting such a perspective would mean giving up economic security. This mechanism as described by Beck is wealth production that does not take into account related economic and social risks and subsequently causes the risks to become ever greater and when this finally reaches social awareness, it transforms social ties from a community of poverty to a community of fear.

Lack of local community involvement in key decisions for company development relates to lack of access to information on how company operations influence the environment. Little transparency in this area led to situation where attributing responsibility for pollution was limited. The structure of town sewage system did not facilitate the tracing the pollution discharge sources. This, as respondents admitted, suited all the enterprises using the sewage system. Results of controls made by regional environmental protection inspection were not published, which added to the sense there was no definite culprit. Pollution monitoring was limited due to financial problems. Ineffectiveness of control institutions and lack of access to expert knowledge on environmental protection left the public with no control over the factory. The factory brought in its own experts who undermined fears and accusations arising from within the local community. This contributed to suspicion towards any actions undertaken by the company, even

when they were positive. As a result, the investments made to minimise external impacts did not improve the image of the company. The main hope of the community was transparency which seemed the only way to bring about normal relations between the parties.

Possible solutions

To enable the local community, open communication of its expectations of the company could potentially contribute to normalisation of relations. Before communication had only been made between the local authorities and the company. Leaving the local community outside causes significant distrust. Including the local community in information process would require removal of an imbalance in access to information. Local community need to have a sense of security in present its legitimate needs and evaluate corrective actions which can only be done after confidence in communication between the company and the remaining stakeholders has been achieved. With regards to conflict escalation, trust is a cornerstone of success in the negotiation process. Rebuilding this essential conflict resolution, will only be possible if all community stakeholders are participants in that they:

- have access to full data;
- can choose together independent experts whom they can trust; and
- have clarity on which company actions result from provisions of law, and which are undertaken voluntarily through their taking responsibility for damage done.

Until now, the local community were spectators rather than participants of the processes. Allowing it to become an active participant would bring a new quality to mutual relations between the town and the factory. However, it is difficult to be sure, because the institutions of public dialogue and participation, particularly in the field of development, have a relatively short tradition in the Polish political system.[14] It has even been said that such institutions are a 'foreign body in the tissue of Polish social life' (Zalewski, 2005; see also Hauser and Marody, 2000; Pańków and Gąciarz, 2001). The failure of decision makers to use participative solutions often becomes a source of conflict similar to those described above, particularly in light of the fact that the factors which underlay such conflict are similar throughout Poland. These factors were caused by an economic transformation and financial problems where fear of poverty produced a *'there is no alternative'* syndrome which demanded that economic issues are considered before social and environmental ones.

Questions

1. What are the economic, social and environmental impacts of the chipboard factory presented in this case study?
2. How could the external costs, caused by the company and borne by the town and its inhabitants, be valued and internalised?
3. Imagine that the local authorities planned a series of meetings with company representatives and the citizens, with the objective of solving the conflict. You have been made responsible for this process. What will you do to facilitate the dialogue?

[14] In spite of commendable exceptions.

Chapter 2.

Systems thinking

2.1. Introduction

The need for systems thinking is increasingly recognised as an approach for studying and communicating our complex and evolving world. As the research frontier confronts this dynamic complexity, scientists are increasingly applying systems thinking in the move towards integration of the different disciplines. When environmental managers and policy-makers address the increasing complexity of their environment they are often surprised by the counterintuitive consequences of many of their decisions. Politicians talk about '*systems solutions*', although often only as rhetoric. Many people have started to realise that our most important problems have more than just one cause. Contrary to common sense, it is not enough to find a single causation and eliminate it. To find true systems solutions, it is necessary to understand a system overall or how many systems may be interacting.

Taking examples of the diffusion of systems thinking into public discussion, below are excerpts from the American press, which have been taken from the website of the writer and systems educator, Linda Booth Sweeney.

> The causes of childhood obesity are multi-factorial... Most of the factors that influence obesity do not work in isolation and solely targeting one factor may not make a significant impact on this growing problem.
>
> (United States Department of Health & Human Services)

> We have created a system for growth that depended on our building more and more stores to sell more and more stuff made in more and more factories in China, powered by more and more coal that would cause more and more climate change but earn China more and more dollars to buy more and more U.S. T-bills so America would have more and more money to build more and more stores and sell more and more stuff that would employ more and more Chinese... We can't do this anymore.
>
> (*The New York Times Op-Ed*, 7 March 2009)

> In many of the poorest countries, poverty, hunger and diminished economic capacity are a vicious circle.
>
> (*The Economist*, 31 July 2004)

Systems concepts also appear in mass media as systems diagrams, which we describe in detail in section 2.3. For example the cover of *The Independent* a British daily newspaper on the 27th of January 2007 contained a headline for an article entitled '*Global warming, the vicious circle*' was illustrated with a classical causal loop diagram, showing how higher temperatures lead to increased evaporation, which in turn contribute to increasing water vapour concentrations in the atmosphere. More water vapour causes the greenhouse gas effect to increase, which results in higher temperatures, and the circle is closed (figure 2.1). What makes this a particularly interesting example, is that it is not common for articles in popular press to be illustrated in this way.

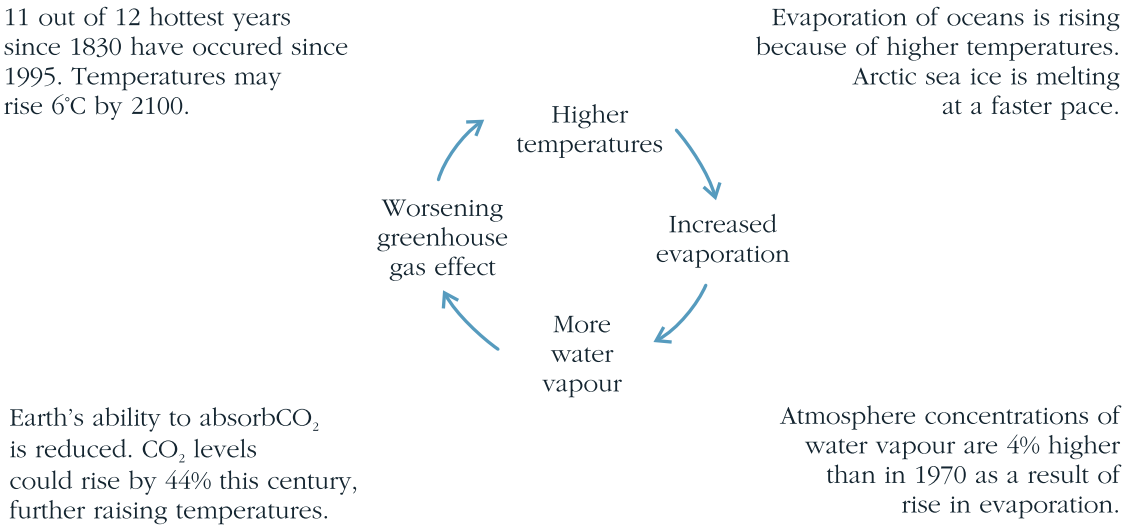


Figure 2.1. Causal loop diagram illustrating vicious circle of global warming

Note that each of the concepts in figure 2.1 reproduced from the original describes a change and the direction of change, for example 'higher temperatures'. In our presentation of the technique called 'causal loop diagrams', in section 2.3, we present variables as nouns only, without any adjectives that would suggest a direction of a change, for example 'temperature' but not 'higher temperature'. In this way, the diagrams are more general so as to explain a number of possible changes in different directions.

The above examples point out the critical elements of a systems approach: multiple influences, interconnectedness, and closed chains of cause and effect in virtuous or vicious cycles.

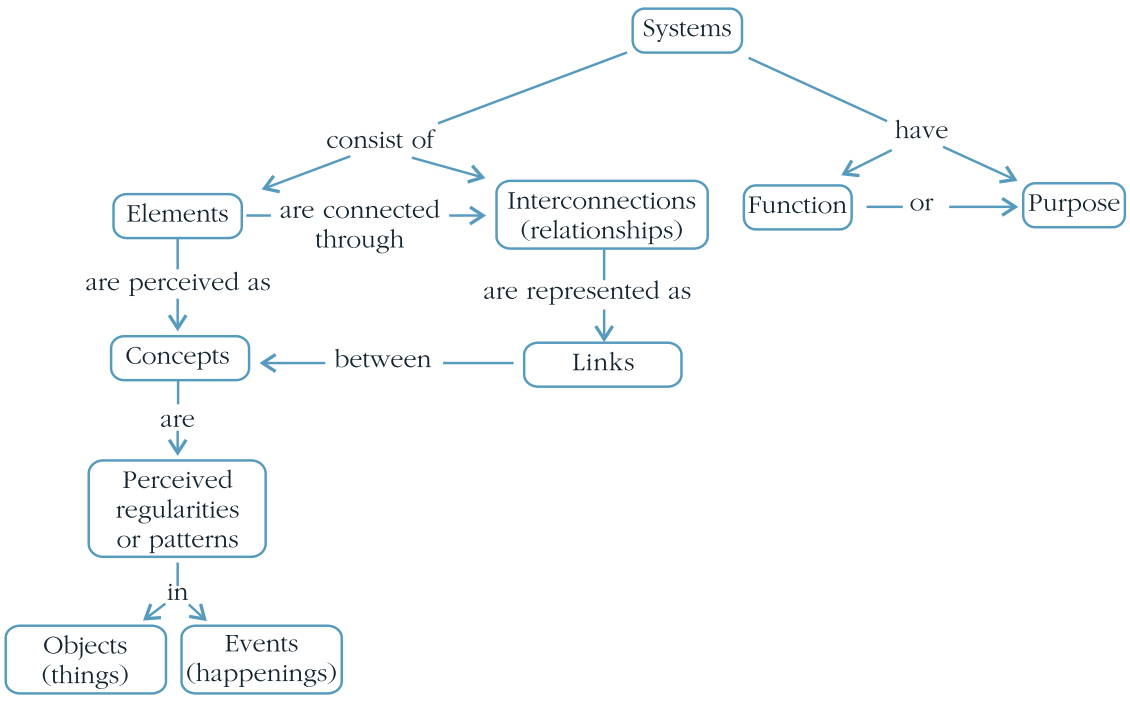


Figure 2.2. Basic systems concepts

Figure 2.2 summarises the basic systems concepts using the 'concept maps' technique (Cañas and Carff, 2005; Novak and Cañas, 2006b). We use this technique throughout this chapter to illustrate new ideas. However, systems are more than simple aggregations of their elements. The interconnections between their elements are critical to understanding the nature of systems. Systems can be distinguished according to their function or purpose. Function is paramount in natural systems where the pattern of interconnections that links elements is critical to their functioning, a pattern also referred to as a system structure. In human-designed systems purpose also becomes more critical. In both cases, the division of systems into elements depends on human perception and can be understood in a number of ways. We create concepts to represent reality and these concepts can be defined as 'perceived regularities in objects or events' (Novak and Cañas, 2006a). The links between the concepts are what represent systems relationships.

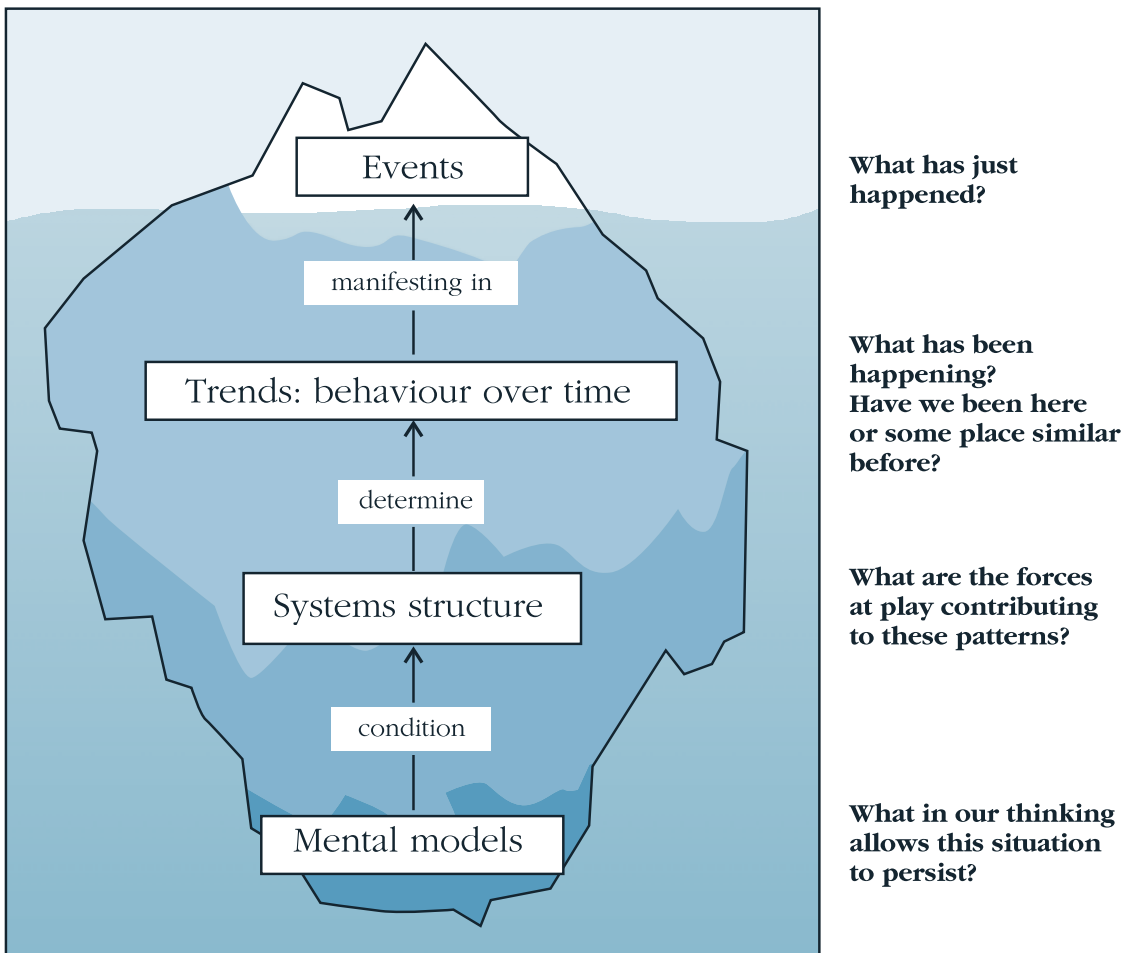


Figure 2.3. System structure as a determinant of its behaviour (adapted from Senge, 1990)

One of the central tenets of systems thinking is that it is structure that determines behaviour. Frequently discussions in the media or in other forums stay at the level of an event (i.e. describing something that has happened). It is also a common tactic for people to assign cause for a problem to an event or to a person. On the other hand at the outset a systems perspective broadens a discussion by placing events in a wider context both in space and in time, revealing certain patterns that are not evident at the immediate scale of the event (figure 2.3). For example, a forest fire in Ukraine in October

2002 left a smog over Warsaw, hundreds of kilometres away. The systems perspective looks back in time to reveal what the trends have been. For example, smog over Moscow in July 2002, created by peat fires, that were a consequence of decisions made 40 years earlier to drain the peatlands.

Following a systems approach, we can define problems in a dynamic way as behaviour in both space and time. These behaviours are patterns and trends that emerge from the interplay of systems elements and the ways in which these elements are linked are what constitutes the system's structure. We use systems tools, for example models, to examine structures that might generate such behaviour.

Finally, we can go even deeper and explore how real structures are shaped by our thinking. We create internal models of the world, called mental models, which we use for making sense of the world and taking action. However, we are not always conscious of these models, and they are especially dangerous when we are not aware of them and therefore cannot identify and revise the drivers of our opinions. Systems thinking allows us to open these black boxes and discuss them in an open space. Mental models can be conveyed as visual icons, verbal expressions, and even in diagrams. The following are some verbal examples of mental models, from Meadows (1989).

> One cause produces one effect. There must be a single cause, for example, of acid rain, or cancer, or the greenhouse effect. All we need to do is discover it and remove it.
>
> All growth is good and feasible. There are no effective limits to growth.
>
> There is an 'away' to which to throw things to. When you have thrown something 'away', it is gone.
>
> Technology can solve any problem that comes up.

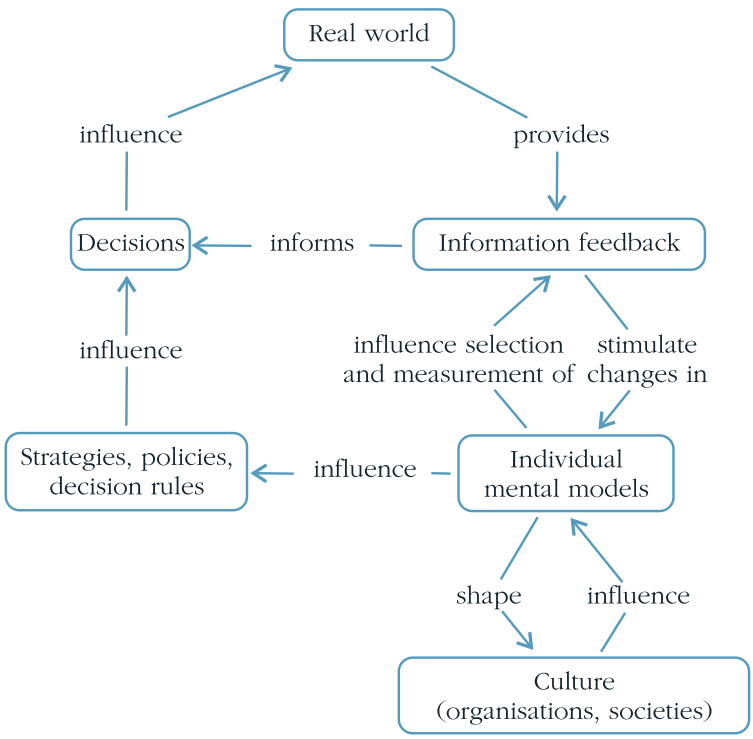


Figure 2.4. Decisions, strategies and policies in complex systems (adapted from Sterman, 2000)

The future is to be predicted, not chosen or created. It happens to us; we do not shape it.

A problem does not exist or is not serious until it can be measured.
Individuals cannot make any difference.

Systems thinking increases our capacity to learn in complex systems by helping us see circular patterns of causation, in a much more complex pattern than our default assumption that chains of causation are linear. By examining which structure created a problem of concern, we start to understand that our decisions do create closed chains of causes and effects known as feedbacks. The operation of such feedbacks often explains how our efforts to adjust are frustrated by unexpected outcomes. Effective adjustment requires recognising and responding to systems structures, such as feedbacks, and the thinking that produced them. We need to understand how decisions are constrained by strategies and policies and how they in turn arise from individual and collective mental models (figure 2.4). The influence of these mental models is profound, for they colour our perception of the world, constraining what we accept and reject as true. The information feedback that we receive from the real world is affected by mental models, and by organisational and societal culture.

We use figure 2.4 in the next section to describe a general framework for systems practice. It is aimed at designing and implementing systems interventions which allow us to improve a situation both in the short and long term while minimising harmful side effects. In section 2.3, we describe one particular systems technique, known as causal loop diagrams that can be quickly learned and understood by non-professionals. Communication of systems insights can also be greatly improved with role-playing and simulation games, to which we shall return in section 2.4.

2.2. Systems practice

In the previous section, we looked at important systems thinking concepts. In this section, we answer the question of how to think in systems. As we have learned in the previous section, we all use our mental models in filtering or analysing information and making decisions. The art of systems thinking is to make these models, and their impacts on how we process information, explicit. In other words, practicing systems thinking relies on model building to reveal the mental models and resultant system structures that influence our problems of concern.

For centuries, people have developed and used models as a means to transparently simplify and generalise key features of the complex world they live in. Such models allowed society to thoughtfully communicate, deliberate over, and decide what to do amid the uncertainty of a changing world. Systems modelling can be carried out using graphical tools, such as conceptual models. These open the discussion of complex systems to include those people who find verbal descriptions too long and complicated. Often a single model can replace the pages of text required to describe all of the variables and their interactions. Thus, systems thinking methodologies provide easily accessible graphic languages. These languages enable us to carefully and rigorously develop mutual understanding between stakeholders of very diverse backgrounds, spanning policy, science, business and local practice to forge these diverse experiences and perspectives into a common conceptual model or family of models. In cases where in-depth knowledge of relationships between systems elements is available, quantitative

models can be built to explore possible future scenarios in a more rigorous way. One very promising aspect of this kind of approach is the system dynamics methodology.

Therefore a model's usefulness depends on how well it represents the diversity of system elements and their interactions. Thus, it is advisable to include a wide range of stakeholder perspectives in modelling process. Participatory model building (figure 2.5) is designed to integrate a diversity of experience through direct participation in model construction and validation. However, according to one perspective (Vennix, 1996), the primary goal of participatory model building is not to build a model itself, but to help people learn about complex problems. These are referred to by Rittel and Webber (1973) as 'wicked' problems, that refer to situations that stubbornly resist solutions because the problems emerge from a messy tangle of different factors (economic, socio-cultural, and environmental), all operating at different scales. Indeed, participatory modelling has been applied to deal with such sustainability problems as the conflict presented in case study 2.C2.

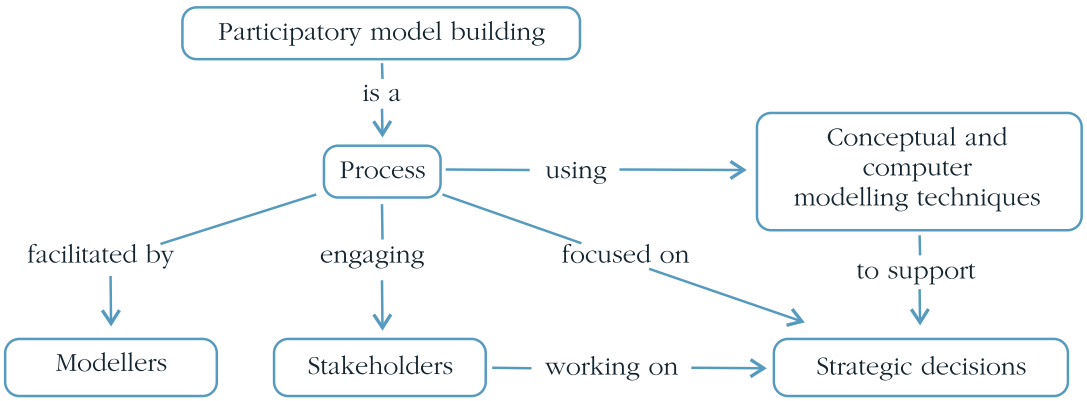


Figure 2.5. Participatory model building

Finding solutions robust to dynamic complexity requires more than a broad sense of understanding because in a changing system, the truth is a moving target. Staying on target requires that insights arising from systems thinking need to be tested and applied. Systems practice should be embedded in an iterative learning cycle (figure 2.6). Such a cycle consists of assessment, policy formulation, implementation and monitoring and is often referred to as adaptive management. Systems modelling, preferably in a form of participatory model building is applied to the assessment phase first to understand a problem in dynamic terms. The dynamics that are indicative of the problem are defined by trends in key variables. Models are then used to put forward hypotheses on how a systems structure can determine the observed trends. Then, during policy (strategy) formulation, models are modified in order to propose alternative systems structures that may improve the situation. However, as we argued above, the model outcomes are not as important as the dialogue between stakeholders that can reveal the real sources of contention between decision makers and what mental models, and terms and definitions influence their decisions. This makes it makes it possible to challenge individual mental models and find new innovative solutions or make better strategic decisions.

In the business world, decades of group modelling experience have established a tradition of successful diagnosis and coordinated implementation of solutions to complex problems (Bertsche et al., 1996; Vennix, 1996; Sterman, 2000). However, expanding beyond this specialisation to the broader world of policy formulation and

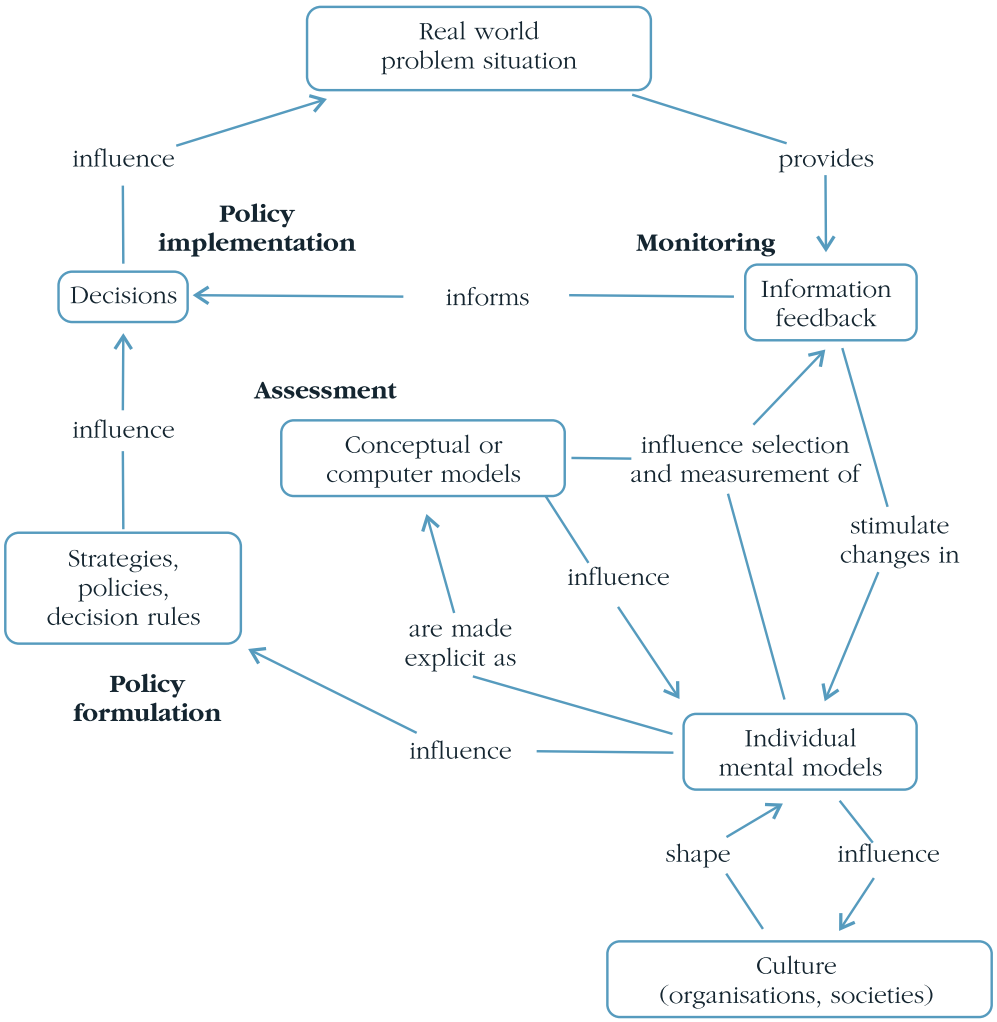


Figure 2.6. Steps in the systems practice learning cycle: assessment, policy formulation, policy implementation and monitoring.

implementation at the much larger scales of society and nature has proven to be much more challenging. Although rare but compelling successes from around the globe point towards a frontier using systems modelling to integrate policy, science and local practice (Van den Belt, 2004). These include experiments in participatory water management in the United States (Van den Belt, 2004, p. 99 and 136; Stave, 2003), in Australia (Exter and Specht, 2003), in Poland (Magnuszewski et al., 2005), and in Hungary (Sendzimir et al., 2008), among others. Moving this frontier in our understanding and methodologies forward requires active learning-by-doing experiments that use modelling to focus and integrate the diverse perspectives of policy makers and scientists.

The steps of systems practice are described in more detail in table 2.1.

Table 2.1. Systems practice methodology

Assessment: problem articulation	Setting overall bounds and internal dimensions.
Identify the coupled human-environment system as the subject of analysis	What are the current goals of stakeholders? What are the problems? Why are they problems?
Select one problem and identify variables defining this problem	What critical factors reflect the problem?
Define problem boundaries (time, space, stakeholders)	How far in the future should we look? How far in the past lie the roots of the problem? How often does the problem occur? Over what geographical area does the problem occur? Which stakeholders (organisations) influence or are influenced by the problem?
Investigate problem behaviour (trends)	What is the historical behaviour of the variables defining the problem (reference behaviour patterns)? What might their behaviour be in the future?
Assessment: Mapping assumptions	Using modelling techniques to visualise the system structure.
Survey existing explanations for problem causes	What are the current theories, hypotheses or beliefs as to why the problem occurs?
Building model(s) of perceived reality	How the world seems to be? What variables should be included? Are the variables inside or outside the model boundary? What are the important interrelationships between variables?
Identify major uncertainties and unknowns	What information is missing or is insufficiently understood?
Policy formulation	Policy is not considered as fixed. Rather it is changing flexibly according to situation.
Setting objectives	What are expected results?
Building model(s) of ideal reality	How should the world be?
Structured debate on change	What are the differences between perceived reality and ideal reality? What are the plausible scenarios?
Defining indicators	Which variables should be monitored?
Policy Implementation	During implementation returning to previous phases may be necessary.
Monitoring	Using defined indicators. Monitoring does not end the process but rather initiates assessment in the next cycle.

In this section, we presented an overall framework of how systems thinking should be applied. In the following section, we present causal loop diagrams as examples of systems thinking methods that can be used within that framework.

2.3. Causal loop diagrams

Conceptual modelling was developed in response to the failure of quantitative systems analysis to cope with the 'wicked' problems. Different methods have been developed to address these problems. Causal loop diagrams provide an example of a qualitative systems tool. The modelling process starts by identifying variables and causal links between them and then proceeds with identification of feedback loops, such as closed chains of causal connections. This language was developed initially to help people identify circular patterns that are often hidden by our default assumption that all causation is linear.

In a group setting, conceptual modelling helps to establish a common language in order to develop a mutual understanding shared by all group members. This graphical language enables us successfully to join diverse participants' experiences and backgrounds into a common model. Conceptual modelling processes can be used to elicit from participants their underlying assumptions and mental models and then express them graphically in the form of a 'map' containing the key system elements and processes. The model can function as a knowledge container; open and easily modifiable when new facts or ideas are revealed or provided during the process. Causal loop diagrams have proved to be a valuable tool in enhancing communication between actors engaged in a problem and can help in planning successful system interventions.

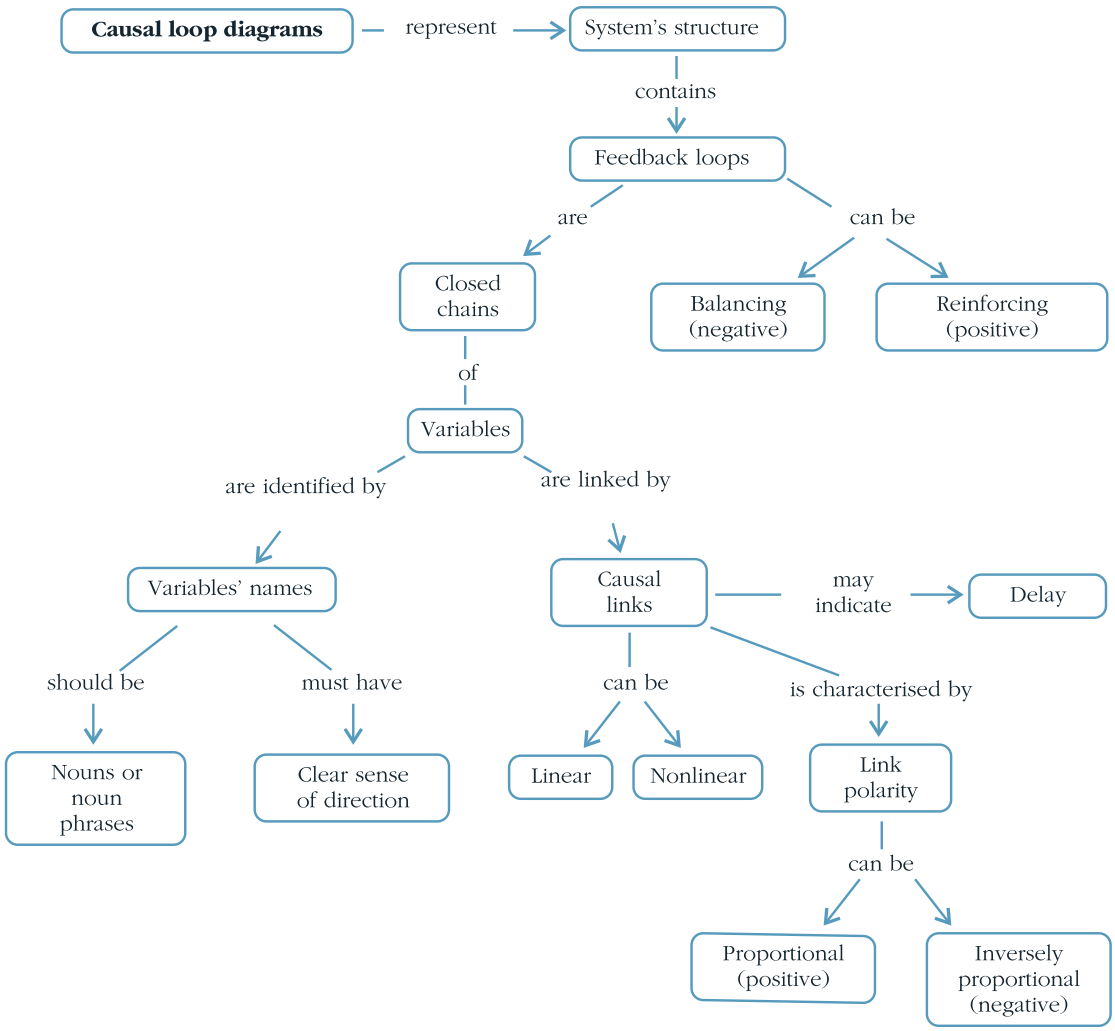


Figure 2.7. The principles for creating causal loop diagrams

Table 2.2. Guidelines for reading causal loop diagrams

	Arrows denote causal relationships.
	Double crossing an arrow means that an effect is delayed.
	A plus sign at an arrowhead means that both variables change in the same direction, for example increase of a cause results in increase of an effect.
	A minus sign at an arrowhead means that variables change in opposite directions, for example increase of a cause results in decrease of an effect.
	Closed chains of causes and effects constitute feedback loops. Loops are numbered and they can be balancing or reinforcing. The character and number of a feedback loop is given inside the loop symbol.

Figure 2.7 and table 2.2 the present principles and guidelines of causal loop diagrams. Closed chains of causes and effects form loops that can be reinforcing or balancing. Reinforcing feedback loops (R) reinforce any change by sustaining the direction of change (either increasing or decreasing it) as we go around the loop. Hence, in the absence of other interactions, they might spiral ever upwards or ever downwards. Balancing feedback loops (B) promotes a balance by attracting variables to certain goals and keeping them close to the goals.

As a simple example of a causal loop diagram, we may consider the Baltic cod discussed in the earlier case study 1.C2 (figure 2.8). As the population of the Baltic cod decreases (due to overfishing), the population of fish species predated by cod (most importantly sprat) increase in number. That in turn is causes zooplankton biomass (on which sprat feeds) to decrease, which leads to algae (food for zooplankton) blooms. Increased sedimentation of dying algae and their decomposition lowers the amount of oxygen in deep water. This worsens hatching conditions for cod larvae leading to declines in the cod population (Döring and Egelkraut, 2008). The chain of cause and effect relationships is now closed, which produces a reinforcing feedback loop, where change in one direction produces further change in the same direction. Moreover this feedback loop does not work in isolation, but in

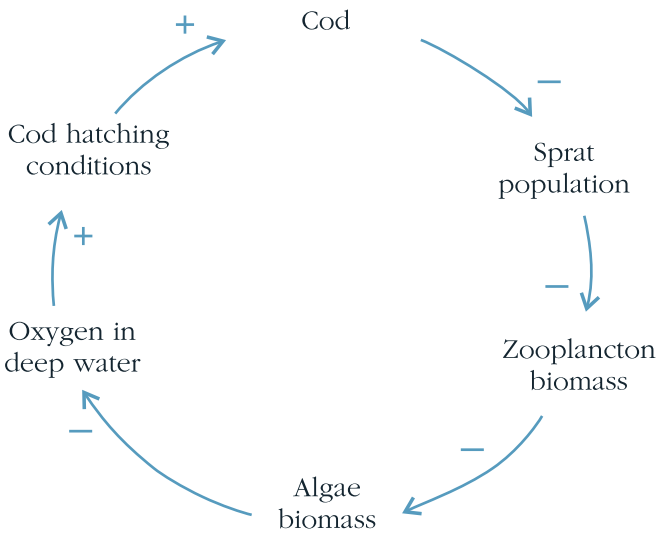


Figure 2.8. Baltic cod, an example of a causal loop diagram

fact it interacts with other feedback loops, with the resulting dynamics quite complicated and difficult to predict. Reinforcing feedback loops can be dangerous, as they may destabilise the system if their activity is not checked by changes in other variables or feedback loops. Therefore, these factors need special attention in a systems analysis.

2.4. Simulation and role-playing games

Simulation games allow us to explore the dynamic consequences of our assumptions in order to design more effective policies and strategies (figure 2.9). Simulation games are open-ended, evolving situations with many interacting variables. Each participant can play a particular role by addressing the issues to hand, the threats or problems that arise in the situation, and experience the effects of their decisions alongside those of other participants. The situation can go in different directions, depending on the actions and reactions of the participants. This is a simulation that presents itself as an evolving case study for a particular social and/or physical reality in which the participants take on roles with well-defined responsibilities and constraints.

In role-playing games, people can play different roles that explore many possible futures, and look at the consequences of their decisions. Role-playing games have also been successfully used as ways to simulate how people can address complex resource decisions, such as sharing water for irrigation in Africa (Barreteau et al., 2001), farming and subsidies in North America (Taff, 1998), and land use change around national parks in Poland (Królikowska et al., 2007). Role-playing games are highly flexible and leave room for the demonstration of individual initiative and imagination, a particular advantage in games involving policy making.

In short, simulation games provide support for education, management and negotiation processes. They can also be seen as an important method of teaching interpersonal skills, problem structuring, and forecasting decisions in conflicts. Two examples of role-playing games used for education in sustainable development in Poland and Hungary illustrate these advantages, in this case: conflicts arising from skiing infrastructure in and around the Karkonosze National Park, and sustainable floodplain management in the Tisza river valley.

One example of role-playing simulation is that used during an educational exercise in community dialogue in the Karkonosze Mountains (Magnuszewska, 2003; Królikowska et al., 2007). The Karkonosze National Park, a regional magnet for tourists provides an excellent example of environmental conflict emerging from tensions between natural heritage protection and economic development. Environmentalists focused on biodiversity, whilst many businesses saw the Park as wasted development potential. The conflict here pivoted around where and how to introduce new ski infrastructure. In spite of several attempts to reconcile the conflicting interests related to the development of ski infrastructure, the conflict remained in place since the early 1990s. Therefore a role-playing game, called the '*Dynamics of sustainable development*', was designed to give students direct experience of the challenges in solving difficult social-ecological problems with many interlinked conflicts and tensions. This approach offered opportunities to understand different, contradictory viewpoints and to become aware of the challenges in untangling and solving complex economic, social and ecological problems. Additionally, as real stakeholders took part in the game, the project aimed to contribute to community dialogue in the conflict.

Another role-playing game on sustainable floodplain management in the Tisza river valley was developed by scientists from the International Institute for Applied Systems

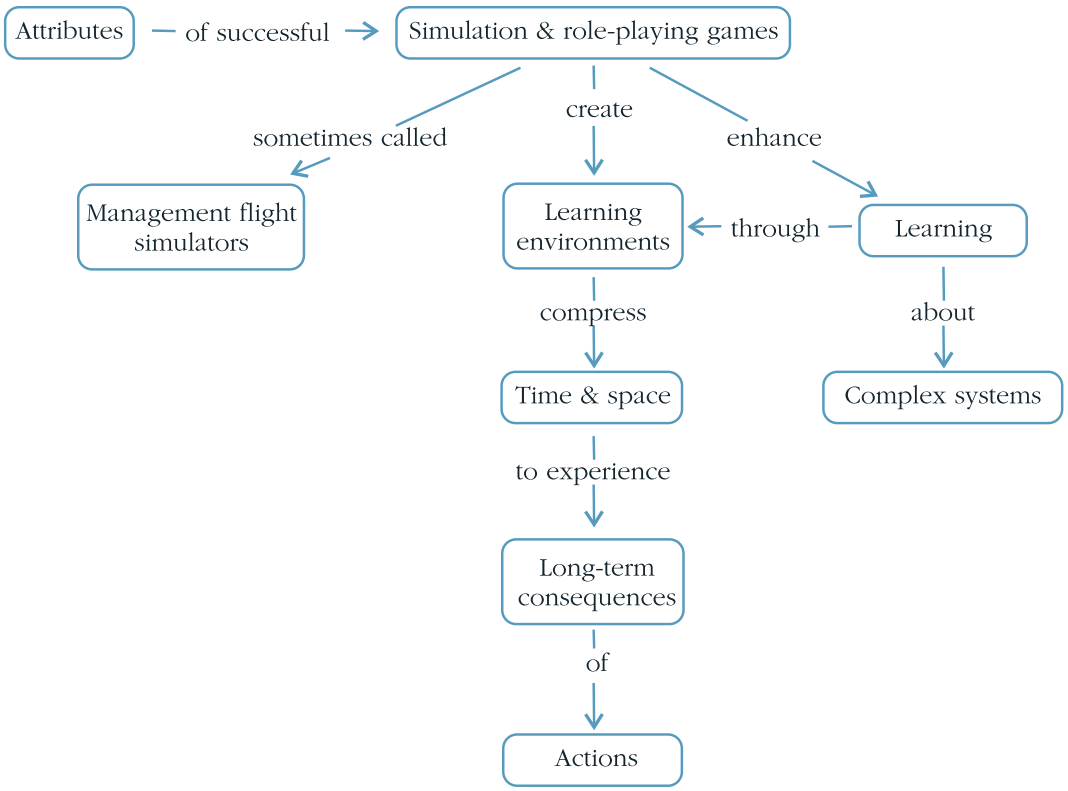


Figure 2.9. Simulation and role-playing games

Analysis (in Laxenburg, Austria) and the Centre for Systems Solutions (in Wroclaw, Poland), in collaboration with Hungarian research institutes and NGOs. In this game, people played the roles of farmers or managers (administrators in government) of river basins. In this play environment, they could explore many possible futures, examining the consequences of their decisions on sustainable development of the floodplain. This game was played by students, farmers, NGO representatives, scientists and policy makers in Hungary, Spain, Belgium and Poland. Participants were surprised and impressed by the fact that their decisions could not be made unilaterally, either as farmers or managers. The game clarified how decision paths are confined by the constraints of imperfect knowledge (see section 1.4), environmental uncertainty, lack of policy integration, mutual interactions, sunk costs of infrastructure and technological lock-ins.

2.5. Summary and conclusions: sustainability as a systems concept

As sustainable development becomes a mainstream concept, there is a growing need to apply it in practice and ensure its viability. Otherwise sustainability will become an empty word. In order to achieve sustainability, we require truly trans-disciplinary and trans-sectoral approaches. We also need a conceptual framework to unify knowledge and data. Altogether these should provide operational guidelines and enrich intuitive understanding for everyone. Systems thinking and systems practice tools can be successfully used to support transition to a sustainable world (figure 2.10). As we shall see in the following case studies, one area where systems thinking is particularly evident is studying the functioning of ecosystems that provide lessons for improving the sustainability of man-made systems.

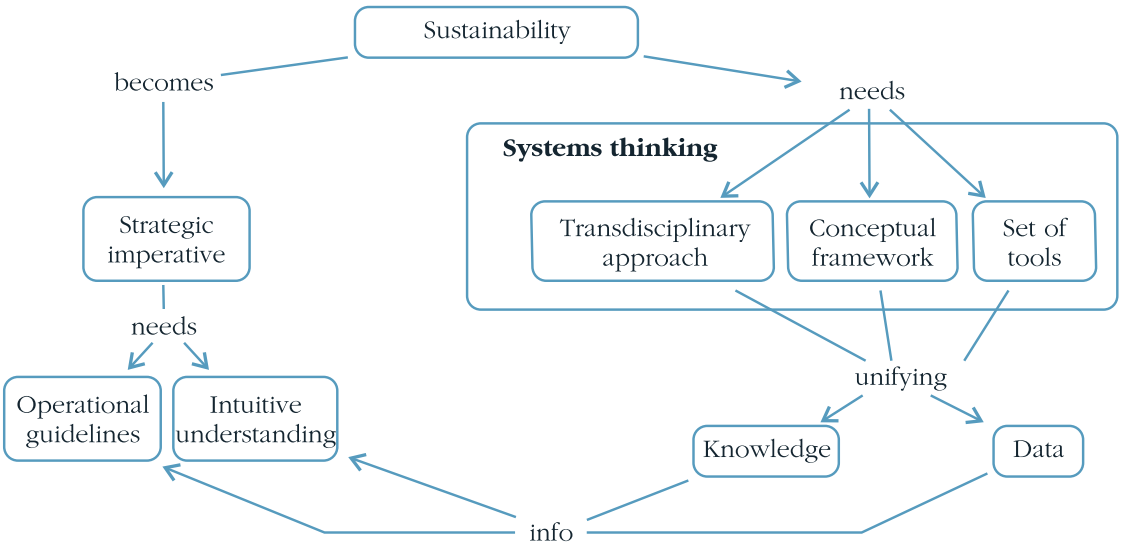


Figure 2.10. Sustainability operationalised through systems thinking

Practical resources

Sterman, J.D. (2000), *Business dynamics: system thinking and modelling for a complex world*, Boston: Irwin/McGraw-Hill. A classic volume on applying systems thinking in the business world.

Senge, P.M. (1990), *The fifth discipline: the art and practice of the learning organization*, New York: Doubleday. An influential book focusing on group problem solving using the systems thinking method to change companies into learning organisations.

Vennix, J., (1996), *Group model building: facilitating team learning using system dynamics*, New York: Wiley. A handbook on participative method for analysing qualitative data.

<www.sysdyn.clexchange.org/road-maps> *Road maps: a guide to learning system dynamics* is a series of self-guides created at MIT, in order to help students and teachers learn the principles of system dynamics.

<cmap.ihmc.us> CmapTools is a software enabling modelling knowledge presented in the form of concept maps.

<www.systemdynamics.org> System Dynamics Society is an international, non-profit organisation devoted to encouraging the development and use of system dynamics and systems thinking around the world.

<www.crs.org.pl> Centre for Systems Solutions is an NGO from Wroclaw, Poland, that applies a systems approach to research, educational and advisory activities, and others by developing simulation games, such as the sustainable floodplain management game.

Questions

1. **Teacher's opinion**
   Paul is 13 years old. He claims that the mathematics teacher pesters him, and it makes Paul reluctant to study. The teacher, on the other hand, says that his opinion of Paul is based on his low grades. What do you think is the cause and the consequence here? Draw the relationship in a diagram.

2. **Draw a one loop causal diagram – reinforcing feedback loop**

a) Population growth

In a demographic context where the majority of people are of child-bearing age, it can be said that the larger the population is, the greater the number of births will be.

b) Permafrost

'Enormous amounts of methane are believed to be trapped in the Arctic permafrost. Methane is one of the most potent of the greenhouse gases, and scientists fear that a reduction in the area of the permafrost could release the methane into the atmosphere, where it would lead to an increase in absorbed radiation, and further increases in air temperature and still further reductions in the area of the permafrost' (Ford, 1999).

3. **Eutrophication of shallow lakes**

Present the relations described below as links in a single reinforcing loop. Connect these three loops in one model. Include nutrient inflow.

a) The more algae that is present in water the higher the turbidity. High turbidity restricts the possibility of vegetation growth. Vegetation, such as emergent flowers and reeds, are necessary for zooplankton to hide. Zooplankton feeds on algae.

b) A high concentration of nutrients in water promotes the growth of algae. The more algae present in water the higher the turbidity. High turbidity restricts the possibility of vegetation growth. Nutrients are necessary for vegetation to grow.

c) Suspended sediments increase turbidity. High turbidity restricts the possibility of vegetation growth. Vegetation keeps sediments on the bottom by slowing water flow and causing them to precipitate or by preventing their resuspension.

4. **Draw a one loop causal diagram – a balancing feedback loop**

a) Congestion

The traditional solution to traffic jams and congestion has been road building. As travel time increases, as traffic jams become the norm, as the rush hour extends from dawn to dusk political the pressure for new roads will build (Sterman, 2000).

b) Green plants' and their impact on global warming

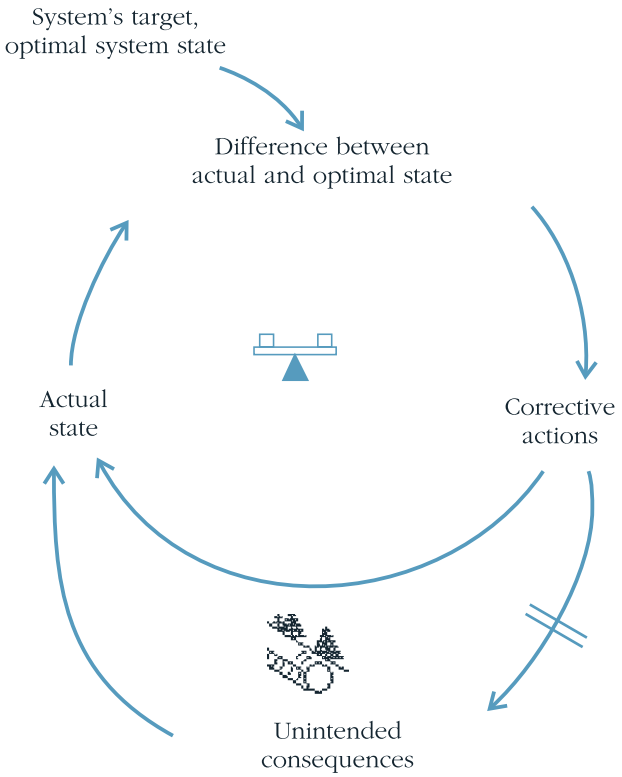
Trees and other green plants may respond to warmer air temperatures with accelerated growth. Green plant photosynthesis would lead to greater CO_2 absorption, thus less CO_2 in atmosphere, and less absorbed radiation and a reduction in air temperature (Ford, 1999).

5. **Policy resistance**

Draw a diagram representing the following story according to the template below.

a) Flood Protection

From practical experience, dykes and artificial reservoirs have provided good protection against small and medium-sized floods, but not against really big ones. Additionally flood protection systems create a false sense of security on the floodplains thought to be protected. This sense of security encourages investors to build on the 'protected' area, and when large scale flooding occurs the losses are much higher than before development. Big losses increase demands to strengthen flood protection measures. As a result a vicious circle is begun: protection → investment → loss → more protection → more investment → bigger loss. Notably in many countries where spending was increased on flood control it did not decrease the costs of flood losses but exactly the opposite.



b) Insecticides

Of the many pests that damage potato crops, one species of beetle has caused significant losses. Scientists invented a new type of insecticide, lethal for this particular pest species. Intensive crop dusting was applied. Soon after this the number of beetle pests significantly decreased. However, after few years people noticed that beetle numbers started to increase again and that the insecticide, while initially successful, was no longer effective.

c) Fires

Policies on fighting fires in America have led to an increase in both size and severity of forest fires. Furthermore as a result of this policy the frequency of small fires had decreased which led to accumulation of dead wood and other combustible plant litter, the reason why fires became bigger, hotter and more dangerous. These large fires often destroyed even the oldest and biggest trees, which were normally resistant to smaller fire events (Sterman, 2000).

Case study 2.C1.
Sustainable development in the Barycz Valley[1]

The Barycz River is one of the largest tributaries of the Odra River, in south-west Poland. Its flat lower valley and steep slopes of the surrounding hills consist of diverse habitats in a mixture of forest, meadows and ponds, as both large and small ecosystems. The Milicz ponds, an ecological hotspot in the area attracts large flocks of migratory birds.

Changing political and economic conditions has led to increased unemployment, with the resulting responses posing many threats to the biodiversity of the Barycz Valley. The challenge is to preserve biodiversity and at the same time improve the local economy and this has led to the creation of a coalition project of NGOs active in the region. The project sought the assistance of external experts, through the use of systems thinking and participatory models. A regional sustainability model was then developed for potential development options that used an initial set of indicators to measure progress.

These systems thinking tools were intended to empower local professionals and stakeholders to better use their own experience, create their own policies/practices, measure their own progress, learn from the process, and continue to innovate. People thus empowered were then better prepared to adapt ideas and experience from other spheres into their local situation, as they would be able to detect failures and make improvements. Thus, the project's objective was to establish a framework for different NGOs to discuss their various visions and approaches and to develop their own indicators and targets by which they could measure individual progress towards sustainability. In this way, they could share each other's experience and continue to develop a common vision that would unite actions in the region.

The project proceeded via a series of workshops with NGOs, with local stakeholders and students occasionally joining project group meetings and discussions. Here professionals in local NGOs were helpful contributors in establishing an adaptive management framework, that helped initially to integrate new ideas and methods, and subsequently act as bridges of understanding for local stakeholders, and with whom they had established trust over a number of years. The NGOs were then responsible for passing this new knowledge on to local people and involving them in the project. This approach was taken because had all stakeholders been directly involved in all phases the project would have been far more costly and time consuming.

The graphic language of causal loop diagrams made it possible to successfully join diverse participant experiences and backgrounds into a common model to explore regional sustainability. Firstly, a list of potential variables was elicited. Secondly, the initial list was narrowed down to a practical range of key variables (in this case less than 25). The project participants proceeded with linking variables and slowly developing a graphic image of the system structure. As the web of relations took shape, certain sections became more understandable as identification of reinforcing and balancing feedback loops revealed the system macrostructure. In this way, a vast and dense 'thicket' of links was reduced to a smaller set of variable clusters that interact with each other. Causal loop diagrams at project workshops facilitated eliciting from participants' underlying assumptions and mental models to express them graphically in the form of a 'map' which contained the key factors and processes in the region. In each of these discussions, the model was illustrated on a large sheet of paper and hang on the

[1] For a more detailed description of this case study, see Magnuszewski et al. (2005).

workshop wall, plainly showing the complex relations between nature and society in these rural landscapes. The model proved to be easy to understand not only by project participants but also by other local stakeholders and students.

Fundamentally, using the model disciplined the group discussions in a positive way. Differences (and agreements) in opinions were articulated much more precisely and gaps in understanding were discovered more efficiently.

A regional sustainability model

A conceptual model of regional sustainability issues (see figure 2.11) was developed in response to the overall goal of the NGO participants in the project. The model was intended to analyse and measure how their projects contribute to improving or sustaining the quality of the regional environment. However, it should be stressed that this model, created during the first cycle of an adaptive management framework, contained mostly assumptions of the NGO professionals on the analysed system. Such assumptions need be challenged and refined by local stakeholders as they become involved during consecutive cycles of discussion. The following narrative complements figure 2.11 in portraying the factors and system structure identified by the modelling process as the key to the problem of concern: in this case regional sustainability.

When *environmental quality* deteriorates, *social support for environmental standards* increases as people, seeing the poor state of the environment, are more eager to support standards to improve it. This support enables the introduction of higher *environmental standards*, which in turn raises the level of *environmentally friendly practices*. After some delay this leads to improvement of *environmental quality*. These relationships create the balancing loop (B2, rescuing the environment) that operates to keep *environmental quality* in a good state.

Whilst we assume that higher *environmental standards* increase the level of *environmentally friendly practices*, this is only true if we keep for example the number and area of *environmentally friendly farms* the same. The immediate result of introducing new *environmental standards* may be a decrease in *profits from environmentally friendly crops*, which may discourage some farmers and decrease the number or area of *environmentally friendly farms*. This suggests that introducing new *environmental standards* can affect the level of *environmentally friendly practices* in two different ways and one cannot be certain whether the level in question will rise or fall. In effect, this may cause the loop B2 (rescuing the environment) not to operate in the desired way.

When *profits from environmentally friendly crops* go down, *perceived environmental benefits* (ecosystem services that are perceived by the community in the region, see section 1.2) will also go down. This will lower *social support for environmental standards* and in turn make it more difficult to maintain *environmental standards* (our main tool for improving *environmental quality*). This describes another balancing loop (B1, environmental standards raise costs and lower crops, as a consequence of lower productivity), operating to keep *environmental standards* at a low level. This loop also describes the resistance that environmental NGOs often encounter. The source of this resistance is the mental model which states that a good environment means a poor economy. Further elaboration of the model, however, identified other loops that showed that this does not always have to be true, even though in the short term it often happens this way.

The analysis above shows that in order to start the process of improving *environmental quality* through increasing the number of *environmentally friendly farms*, an external driver is needed. Such a driver can be provided through *organisational support*

for environmentally friendly farms. In practice, this is mostly done by environmental NGOs, but can also be done by local or regional authorities and other institutions. Usually such stakeholders decide on the target, the *desired level of environmentally friendly practices* and then apply pressure until the gap between the actual level of *environmentally friendly practices* and the *desired level of environmentally friendly practice* is closed. This process creates another balancing loop (B3, organisational pressure for environmentally friendly practices), which is extremely important for achieving environmental goals. This is aimed at making the system operate without external support, meaning that ultimately *environmentally friendly farms* need to become economically self-sufficient. However, in order to achieve this, there must be a certain period of sufficient support provided to the farms in question. It needs to be emphasised here that *organisational support for creating environmentally friendly farms*, alongside producing and promoting green local products and developing green tourism, is a crucial factor for success in the process. Recent research on implementing innovation (Repenning, 2002) shows that cutting external support too early has been one of the main reasons for collapses in improvement initiatives. Therefore the balancing loop B3 must operate for a sufficient enough time to enable the reinforcing loops that amplify innovation, to operate in the desired direction. The role of environmental NGOs (or other institutions) in this is to keep this process operating until critical thresholds have been reached and reinforcing loops can amplify both economic and environmental goals simultaneously.

The first reinforcing loop (R1, revenues from agri-environmental programmes) connects *environmentally friendly practices* with *profits from environmentally friendly crops*. The *environmentally friendly farms* become more profitable, which encourages other farmers to increase *environmental standards* and generates more *environmentally friendly practices*. Finally, this makes it possible to obtain greater *revenues from agri-environmental programmes*. Increasing *profits from environmentally friendly crops* also makes it easier for people in the region to perceive the environmental benefits, and raise *social support for environmental standards*. Thus, a short-term drop in *profits from environmentally friendly crops* can be corrected through longer-term *revenues from agri-environmental programmes*.

The other long-term process here is connected with 'green tourism' opportunities, which are possible only when *environmental quality* is sufficiently good. Improving *environmental quality* influences *touristic attractiveness* of a region but only after a significant time lag. Increased *touristic attractiveness* makes it possible to obtain additional *profits from green tourism*, which in turn raises *perceived environmental benefits*. This process closes another reinforcing loop (R2, natural heritage attracts tourists). It also affects the balancing loop (B1, environmental standards raise costs and lower crop production) making it easier to keep *environmental standards*.

Environmental standards do not only define the standards that farmers must follow but can also be used to introduce a local brand of '*green local products*' (GLP). If *GLP production* brings profits then part of this can be reinvested to increase or diversify production, bringing greater *profits from GLP*. These links create the reinforcing loop (R6, GLP growth through reinvestment). *Profits from GLP* raise the *perceived environmental benefits* which also contribute to higher *environmental standards*.

The relation between production and profits from green local products is clearly influenced by many factors, such as: *attractiveness of green local products to consumers*, external *support for green local products*, *regional food processing capacity* and *local cultural identity*. *Brand attractiveness* constitutes another important factor as the successful introduction of a brand may greatly help in marketing and sales of GLPs.

Environmentally friendly farms and *GLP production* are thus tightly connected. *GLP production* is mainly based on crops from *environmentally friendly farms*, and increased demand for crops from *environmentally friendly farms* leads to greater *profits from environmentally friendly crops*. This makes being an 'environmentally friendly farmer' more attractive and leads to the growth of the *environmentally friendly farms*. This process creates another reinforcing loop (R5, environmentally friendly farms and green local products reinforce each other).

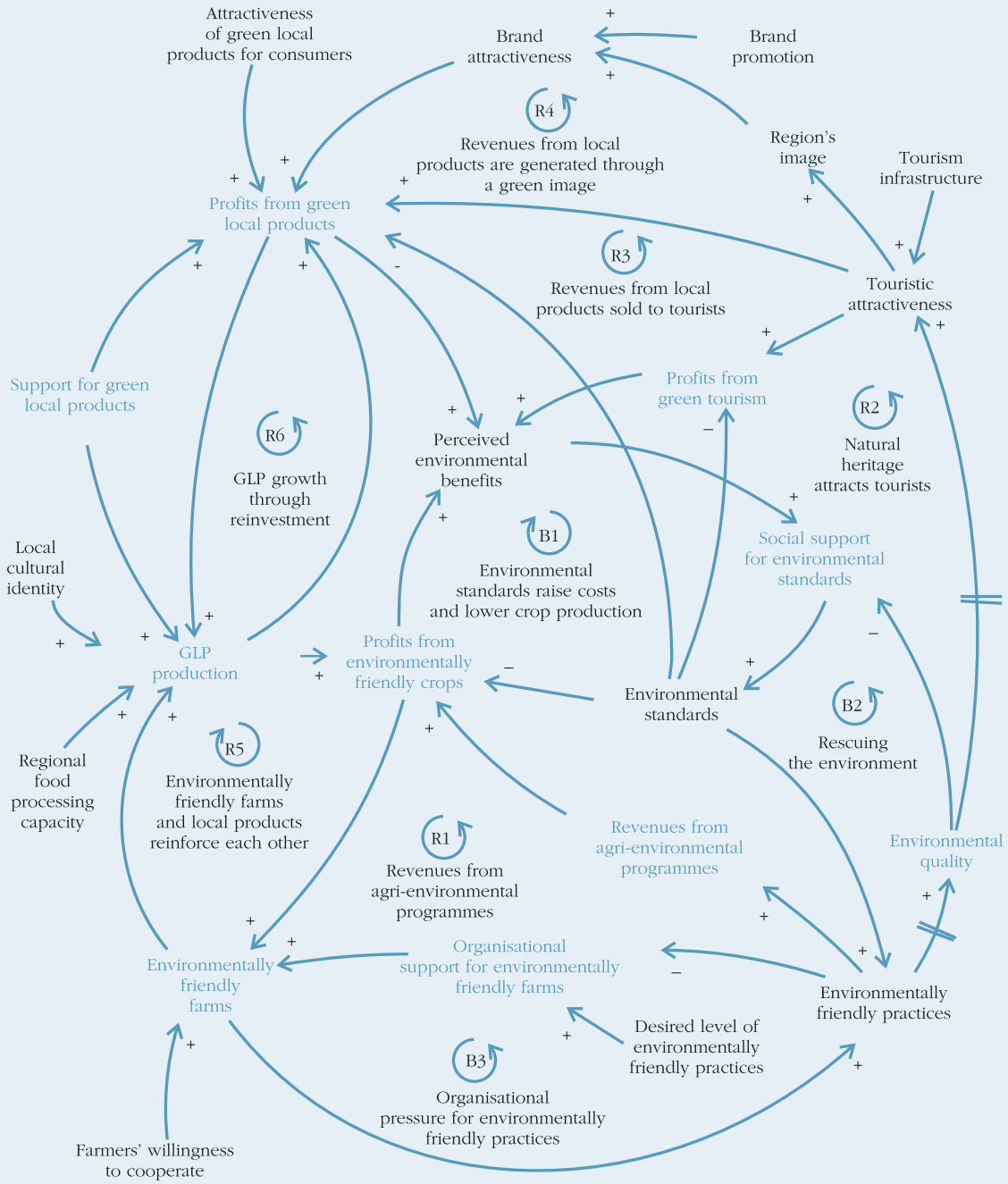


Figure 2.11. Variables and causal links in the Barycz regional sustainability model. Variables marked in blue are the key variables, used as the basis of sustainability indicators

Green local products are also connected with tourism because many *green local products* will be sold through green tourism facilities. In this way, *touristic attractiveness* affects *profits from green local products*. This link closes another reinforcing loop (R3, revenues from local products sold to tourists). *Touristic attractiveness* also improves the *region's image*, which makes the local brand more recognisable and attractive. These links then close reinforcing loop (R4, revenues from local products are generated through a green image).

To sum up, the balancing loop B1 operates in the short term hampering the introduction of *environmental standards* aimed at improving *environmental quality*. Over the long term, reinforcing loops R1 to R6 make environmental benefits more obvious to the community in the region. This means that introducing *environmental standards* is a process that requires patience and it is necessary to sustain innovative practices long enough to overcome the initial negative economic lag effects. The model here helps us to understand that the 'environment or economy' paradigm is a false dichotomy when we look at the situation over a sufficiently long period.

Sustainability indicators

Based on the understanding of regional sustainability issues that were gained in developing the conceptual model, steps were taken by participants to obtain the instruments for measuring progress, i.e. the sustainability indicators. A regional sustainability model was the basis for identifying the most important variables (marked in colour in figure 2.11) to then derive the sustainability indicators (table 2.3). These indicators could also be improved upon in the ongoing process of formulation, measurement and revision.

Conclusions

Systems concepts and methods, such as analysis of mental models and causal loop diagrams, are impressive for their power to clarify complexity but can also be intimidating when first encountered. Systems science engages and integrates multiple disciplines and experiences, taking years of training and application to master. However, with the help of experienced systems scientists such methods can be practically employed by both professionals and lay people to develop regional sustainability strategies and indicators. For this, much attention has to be paid to clarifying the basics, including the specific language of systems analysis, and to providing participants with an opportunity to use the knowledge they acquire during the exercises. Causal loop diagrams also have to be discussed gradually, starting from a single loop and then building the whole diagram around it.

This project formed the basis for a longer term collaboration between systems scientists and NGOs in the Lower Silesia region. In particular, this systems approach was then applied to the subject of green local products in a subsequent project.

Table 2.3. Key variables and the indicators that describe them

Key variables	Indicators
Environmental quality	Biodiversity – number of species Water quality Percentage of viable habitat (green area)
Environmentally friendly farms (EFF)	Ratio EFF/Total (number) Ratio EFF/Total (area) Conversion rate
Revenues from agri-environmental programs	Percentage of maximum subsidy Percentage of minimum yearly income
Green local product (GLP) production	Sales revenues as percent of total sales per firm Number of people employed Number of firms
Profits from GLP	Total amount earned in region Average profitability from GLP per firm
Profits from environmentally friendly crops	Total amount earned in region Average profitability from environmentally friendly crops per farm
Profits from green tourism (GT)	Total amount earned from GT in region Average profitability from GT per firm
Organisational support for environmentally friendly farms	Hours of work on projects Perceived support by farmers
Brand attractiveness	Brand awareness and acceptation
Support for green local products	Hours of work on projects Perceived support by green local producers
Social support for environmental standards	Percentage of population that supports environmental standards

Questions

1. What solutions in the Barycz Valley would bring about benefits for both the local economy and the environment? Why would these be better than other solutions?
2. What other factors might have a positive impact on environmentally friendly practice in this region? What potentially unexpected negative outcomes might they cause?
3. Based on the case study of the Barycz Valley, explain why the 'environment or economy' paradigm is a false dichotomy.

Case study 2.C2.
Envisioning management alternatives for the Tisza river valley[2]

The Tisza is one of the largest tributaries of the Danube, flowing from the Carpathian Mountains over the vast alluvial plain of east Hungary. Its springs are located on southern slopes of the Ukrainian Carpathians, with its delta in Serbia. This sudden shift from steep to flat topography creates some of the most extreme flood dynamics in Europe in that Tisza's level can rise more than twelve meters within 24 hours following major rains in the mountains of the western Ukraine and Romania (BME ViKöK, 2003; Sendzimir et al., 2004). These flood waves, as well as industrial accidents, result in toxic spills, devastating riverine fauna (fish in particular) and tourism in the region. Serious floods take place approximately every 10–12 years (BME ViKöK, 2003), but the last century has seen rising trends in all facets of flooding: peak elevation, volume, frequency and, especially, damages (Sendzimir et al., 2004). The roots of these alarming statistics may, however, lie in the numerous hydro-engineering projects that have significantly transformed the river over the last three centuries in order to change the landscape for grain cultivation (deepening of the riverbed, shortening of its course, and construction of dykes etc.). The existing water control infrastructure repeatedly proved to be ineffective when faced with ever higher flood waves with each subsequent flood.

By the late 19th century, the accumulating problems of water stagnation, lost productivity and rising flood trends reached crisis proportions, provoking basin-wide re-engineering under the original Vásárhelyi Plan (Molnar, 2005; Sendzimir and Flachner, 2007). This plan began a process that over a century eventually protected 97% of the basin from the risk of flooding with over 4500 km of primary and secondary dykes along the Tisza and its tributaries. This work also consisted of embankments around some 840 smaller settlements and circular levees around 48 cities and large villages (Siposs and Kiss, 2002). In addition, some 40,000 km of canals were added to decrease the groundwater levels and hasten drainage of wheat fields and support irrigation (Szlávik et al., 2000). The Tisza floodplain landscape pre and post implementation of Vásárhelyi Plan is illustrated in figure 2.12.

In the meantime, important external changes, such as large-scale felling of forests in Ukraine and climate change, reduced the reliability of the previous measures. In recent years, raising of dykes was accompanied by increasing maximum levels of water, thwarting these measures undertaken to protect the valley against floods. As a result, currently, the Tisza valley faces a trap emerging from linked destabilisations of its component economic, social and ecological systems. Local communities show increased anxiety in the face of a future that appears more and more uncertain due to the increasing threat of flood damage, economic stagnation, and demographic collapse through emigration from the region. Rigid retention of conventional water management policy has forestalled any innovations in riverine land use or economic practices that might provide alternatives to escape the trap.

Most of the water management activities undertaken in the region still reflect a conventional paradigm (i.e. mental model) of 'protecting the landscape from the river' and this is centrally planned from distant Budapest (a system structure). However, over the past few decades, an informal network of scientists and local activists (hereafter

[2] For a more detailed description of this case study, see Sendzimir et al. (2007). This is the only case study in this book that does not refer to Poland. The reason we decided to include it is that in Central and Eastern Europe it presents a unique example of using the concept of adaptive management to solve a complex problem related to economy–society–environment interactions.

referred to as the '*shadow network*') managed to initiate a serious debate aimed at understanding this trap situation and how social-ecological interconnections have influenced the existing river management regime, and reinforcing its destructive mechanisms. Years of discussion within Hungarian society produced readiness to consider new approaches. The following example illustrates the use of conceptual modelling in this discussion.

The project was aimed at taking into consideration the different concepts and ideas involved in order to avoid the trap of the current management regime. This approach allowed for assessing barriers and possibilities and for transforming water management in the area into a more flexible and adaptive system. Particular focus was made on how the existing water management regime can be transformed by alternative policies, based on a new paradigm of '*living in harmony with the river*', adapting the use of the environment to the environment and not vice versa (Smits et al., 2000). Innovations recommended by this informal network would then become a basis for substantial change of the water management strategy's direction towards an integrated water and landscape management plan.

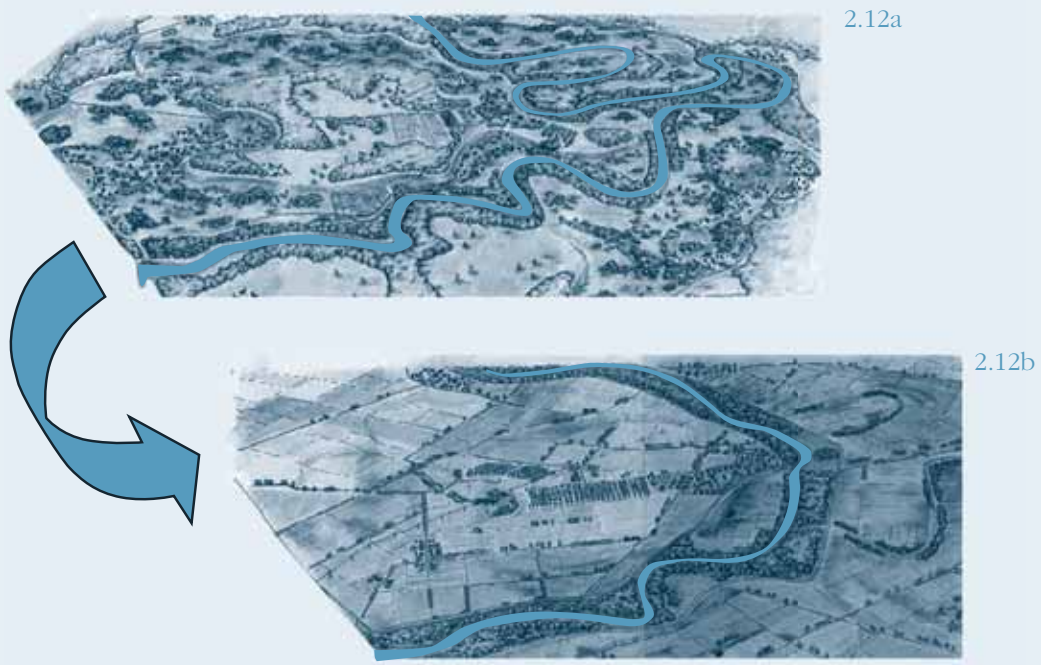


Figure 2.12. An artist's interpretation of the different landscape mosaic patterns in the Tisza river floodplain, both pre (2.12a) and post (2.12b) implementation of the original Vásárhelyi river engineering plan in 1871 (Siposs and Kiss, 2002)

Modelling structural relations that bridge or block transformation

The *shadow network*'s dialogues generated significant goodwill in the Tisza region by building trust and mutual understanding. However, all of the diverse narratives were yet to be coalesced into a single, comprehensive and convincing vision. The diversity of alternative explanations continued to overwhelm understanding, fragmenting opinion and stalling initiative. This failure to unite and rally stakeholders around an alternative approach was a key barrier to transformation. Barriers are typically reinforced by a lack of any clearly recognised leader (Olsson et al., 2006). Leadership is needed to develop

a vision, build links to social networks and lead a sustained debate that institutionalises 'social memory' and rallies society to action. Such a unifying vision would greatly help efforts to build networks, by including more Tisza river communities into the dialogue to gain and spread understanding on how to reverse the regional decline.

The following paragraphs describe the process of the group model building exercises that aimed at expanding dialogue, and moving beyond '*laundry lists*' of factors to look at the web of interactions underlying complex behaviour. For clarity, we have confined our observations here to those parts of the models that elaborate hypothetical causal structures that influence barriers or bridges towards transformation.

Many of the factors influencing transformation can be clustered into four principle groups, shown in the enclosed boxes in figure 2.13, which represent sets of interactions that persistently reinforce key paradigms and their associated processes. As we describe below, this pairs (for the most part) the emerging paradigm '*living in harmony with the river*' with '*landscape productivity*' and the conventional paradigm of '*protecting the landscape from the river*' with '*agricultural intensity*'. Since the latter two currently dominate the situation in the Tisza river basin, we begin by describing the key links that drive interactions within and between them. These links create loops reinforcing the conventional management regime.

The two reinforcing feedback loops (R1a, R1b) drive the current spiral of growth in 'agricultural intensity'. Increases in per hectare *profits on big farms* boost the *intensification pressure* which in turn drives either further land acquisition to increase the *area for intensive use* or the investments in *agricultural technology* that will support more intensive uses (such as larger and more powerful machinery, chemicals and fertilisers). These investments increase *crop yields on big farms* which in turn produces higher profits. Either growth cycle might be tempered by a balancing feedback loop (B1) which links the effects of investments on higher profits (such as increases in area and value of crops at lower elevations in the floodplain) with higher *crop damages by flood*, which in turn lowers yields and ultimately profits. However, B1's potential to temper growth is neutralised by a reinforcing loop (R2) that links higher profits with either of the two drivers (*intensification pressure* or *lobbying capacity of intensive agriculture actors*) on *pressure for flood protection*. The latter pressure increases investments in flood defence, such as *dykes* and canals that lower *crop damages*. These same two drivers also work through two alternate paths of a reinforcing loop (R3) that neutralises processes that support the 'living in harmony with the river' paradigm that competes with the conventional one underlying intensification.

Either *intensification pressure* or *lobbying capacity* temper any *pressure for sustainable floodplain management* (*SFM*). SFM refers here to the collection of alternative river management strategies and land uses that were investigated by the *shadow network*. Failure to augment SFM reduces the capacity to experimentally modify the shape of water control infrastructure and the landscape and intelligently guide (*water control capacity*) flood waters over the entire floodplain (*river–landscape controlled flow*). Even brief flood events guided over the landscape would severely damage dryland grain monocultures on large farms, depressing *crop yields*, *profits* and, ultimately *intensification pressure*.

Drivers of intensification may eventually be countered (balancing loop B3a) by their cumulative impacts on 'landscape productivity'. Technological intensification leads to soil compaction and loss of organic content, while expansion of large farms decreases the spatial complexity of the *landscape mosaic*, lowering biodiversity directly by habitat

removal and introduction of invasive species that displace endogenous flora and fauna. Declines in soil organic matter and landscape topographic heterogeneity depress *landscape water storage capacity*, thereby increasing vulnerability to drought. Vulnerability to drought and declining *soil quality* can depress crop yields (balancing loop B3b) over the long run unless artificial sources of water (pumping) and fertilisers are engaged (balancing loop B4).

While held in check by intensification processes that is associated with the conventional paradigm ('protecting the landscape from the river'), several feedback loops (R4 and R5) embody the potential to augment processes associated with the alternative paradigm. Should *pressure for SFM* succeed in implementing (even at pilot scales) *water control ability* that can re-establish *river–landscape controlled flows*. The pulses of these flows sustain the three-dimensional spatial complexity of the floodplain landscape mosaic. The resultant increases in 'landscape productivity' can best translated into profits by *small- and medium-sized farms* because of their extensive forms of land use can utilise small habitat patches and the dynamic resource availability of an actively pulsing floodplain. Consolidation that creates larger farms disrupts the complex mosaic pattern, and their intensive practices only remain competitive in a static environment. Increasing profitability of extensive practices, coupled with increases in *soil quality* and *biodiversity*, would boost *community well-being*, leading to more active community involvement and lobbying for the processes that support the alternative paradigm. These processes in turn could further enhance 'landscape productivity' (R4) and, concomitantly depress the two key drivers of intensification (R5) as a wetter floodplain decreases the area and intensity of dryland agriculture.

Conclusions

For the past decade a *shadow network* has catalysed and sustained informal learning processes, exploring alternative river management strategies in Tisza floodplain. These informal dialogues have generated a wealth of data, experience and knowledge that bolster the credibility of an alternative river management paradigm: '*living with the river*' along with its derivative management and livelihood practices and technologies. The efforts to extend the regional dialogue using group model building exercises proved useful for *shadow network* participants to more fully elaborate their hypotheses as to what causal structures underlie the processes that either block or promote transformation of the current management regime to a regime based on the alternative paradigm.

Questions

1. What activities would lead to a more sustainable management of the Tisza floodplain? What would make them possible?
2. In what way can climate change influence the chances of carrying out the alternative paradigm of the Tisza floodplain management?
3. In what way would increasing environmental standards in the Tisza floodplain influence the traditional and alternative paradigms of managing this area?

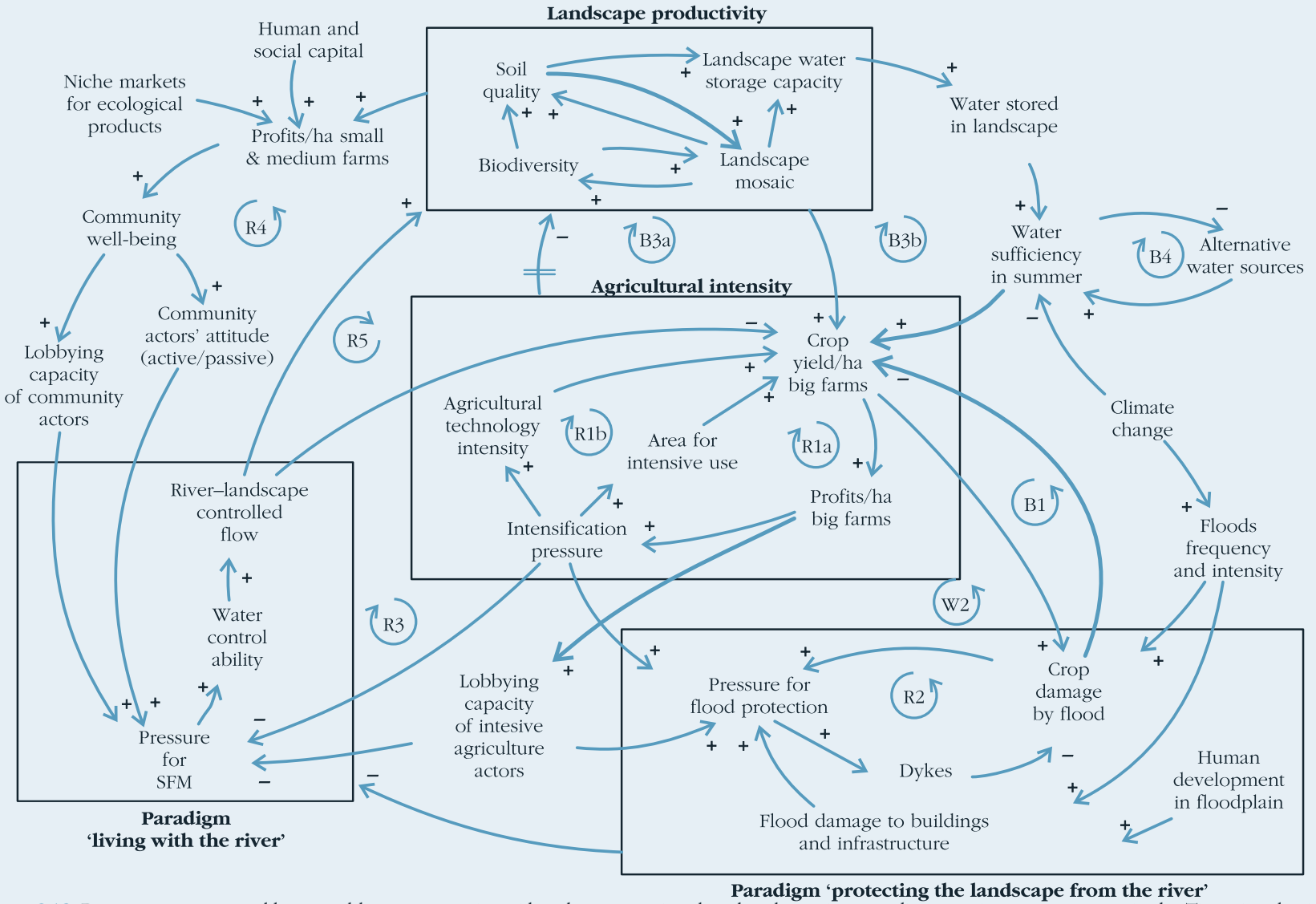


Figure 2.13. Processes represented by causal loops supporting either the conventional or the alternative paradigms to river management in the Tisza river basin

Chapter 3.

Basic theory of sustainable development

3.1. Introduction

The concept of 'sustainable development' is making the big time. Despite the popular use of the term 'balanced development' in the Polish language which is even mentioned in the fifth article of the Polish Constitution there is no doubt that the phrase refers to sustainable development.

It is difficult to imagine any political document or international scientific conference without the obligatory reference to the sustainable development. It is a legacy of environmental protection, quite popular in the previous two to three decades. This new take on the matter began to draw increasing attention in public opinion after environmental protection was convincingly shown to be part of a greater whole, in the context of global economic and social changes, at the United Nations conference (the Earth Summit) in Rio de Janeiro in 1992 (Folmer et al., 1995). Through the adoption of important resolutions and the creation of international institutions, the Rio conference institutionalised the term sustainable development.

3.2. Attempts at operationalisation

John Pezzey (1989) conducted a detailed review of the definitions of sustainable development as used in the literature and politics of the 1980s. Although there was no universal agreement on the meaning of the term, most definitions refer to the approach specified in Gro Harlem Brundtland's report as '*meeting the needs of the present without compromising the ability of future generations to meet their own needs*' (WCED, 1987). Therefore, sustainable development means not only equity in the short term (i.e. meeting current needs), but a much deeper concept of intergenerational equity. Consequently, policies need to solve present problems in a way that ensures both material and social resources are available for further development.

Assuming that sustainability requires maintaining capital at an appropriate level, the concept above poses two questions: First, can loss of natural capital be compensated by accumulation of a different kind of capital? Secondly, if this is so, how can one measure whether compensation is sufficient to ensure sustainability? Fundamentally the way in which these questions are answered will define the economic framework used in the analysis of sustainable development.

In terms of sustainability economic theory describes two completely different concepts as the basis for further development, known respectively as strong sustainability and weak sustainability. The first of these concepts calls for preserving both natural resources and any other resources related to human activity; whilst the second concept implies that it should be sufficient to ensure that the total sum of resources is maintained. In other words, exhausting natural capital is in accord with the concept of weak sustainability as long as it is compensated by the accumulation of remaining resources, i.e. human capital (which comprises of knowledge, technology, institutions and behavioural norms) and man-made capital (such as work tools and other equipment).

Extensive research has shown that individual types of resources are not indefinitely substitutable. Of course, the loss of one type of capital may be compensated by the increment of another to a certain extent. In so much that human or man-made capital shortages may not be acutely felt if accompanied by an abundance of natural capital.

However, as we saw in chapter 1, the proper functioning of the economy and society requires all three capital components and even common everyday observation suggests that natural capital cannot be substituted by other types of capital indefinitely.

Suppose we want to build a house (Daly, 1990), we need all three types of capital: natural (for example, wood as building material), man-made (the axe and the saw) and human (engineering know-how). Of course, better tools enable us to save some wood, for example by trimming the planks more precisely. Also our know-how in engineering may have the same effect, i.e. it is possible to better calculate the thickness of wood planks sufficient to ensure the safe construction. But can natural capital be substituted with other types of capital indefinitely? Will the complete elimination of building materials become possible using some supersaw with laser teeth? Or use of a computer through optimisation of construction methods?

The limitedness of basic capital type substitution precludes against the weak sustainability concept. Leaving the next generation with an unchanged capital sum may compromise the chances of meeting their needs if this sum lacks any of the required key components. Whilst economic theory is capable of solving this problem it can only do so by causing another. Namely, if either of the capital components were to prove critical in meeting needs, its value should correspond to these. If the capital is replaced by a substitute whose value is not fully equivalent, then the sum value decreases, which is contrary to the initial assumption. However, in approaching the issue realistically it is difficult to expect anyone to have at their disposal a fully adequate assessment of biological diversity, natural landscape, or even clean water. Moreover, any assessment would have to be made according to the preferences of the future generation and not those of the present which currently makes economic decisions. Thus, the practical operationalisation of the notion of weak sustainability is highly debatable.

The notion of strong sustainability is, however, equally debatable. After all, natural capital comprises not only of renewable resources, which may be exploited in a sustainable manner, but also finite resources. By definition, the latter may not be passed on to the next generation undepleted unless the present generation ceases to use them altogether. Because it is impossible to imagine our contemporary world without crude oil and other mineral resources, it is also inconceivable that the principle of strong sustainability can be maintained in this rigorous form. However, there is a subtler version of this principle, which allows the use of depletable resources at the same rate that their renewable substitutes are created (Daly, 1990). This principle draws from the so-called Hartwick's (1977) rule of economic growth theory, which postulates the investment of rents collected from non-renewable resource exploitation. However, Hartwick's rule does not specify the direction of such investment as it refers to any type of capital, critically if rents are consumed rather than invested then economic growth will not be sustainable.

In essence, Herman Daly's postulation lacks an obvious logical justification. It assumes the substitutability of the two natural capital components, renewable and non-renewable resources, when their relationship may in fact be more complicated. It is nevertheless widely acknowledged, since it moderates the strong sustainability principle without resorting to the weak principle, believed to 'sacrifice' too easily natural capital for other types of capital.

The doubts surrounding attempts to operationalise the notion of sustainable development call for empirical research. However, ensuring equal access to resources across the generations which is the basis for the sustainability concept is in reality far more problematic.

The principle of equal wealth distribution between generations is typically derived from Kant's categorical imperative, especially in John Rawls' (1971) approach. Such deliberations focus on the idea of a hypothetical convention, where the representatives of different generations meet to decide on the distribution of wealth among them. Key to these deliberations is the fact that the representatives are not aware of the generation they belong to, and that they should act '*behind the veil of ignorance*'.

Of course, there is no way of persuading people to act as if they did not know who they were, although in some cases negotiating an agreement 'behind the veil of ignorance' is indeed possible. For instance, a convention on preventing climate change caused by the burning of fossil fuels can be organised and approved before the participating parties gain full knowledge of who loses more due to such changes (in fact, the international community did adopt such a convention in 1992). However, as a rule the parties are aware of their own positions and interests. Therefore, sustainable development tools, such as taxing energy sources or subsidising clean technologies, are unlikely to be introduced on a scale that has true economic justification. After all, future generations who are not represented cannot secure their interests as effectively as it is done by those who represent themselves now.

In Rawls' original phrasing, communicating 'behind the veil of ignorance' meant fairness in a sense of detachment from specific features of particular entities, such as skills, strength, sex, age, health, and wealth, etc. In general terms, equity meant an order where no one is favoured a priori, and potential inequalities are allowed only as far as they are beneficial to all. This is because some inequalities may turn out to be beneficial even for those who are relatively worse off. This is the case when average wealth increases via those who are relatively better off, causing even the poorest to be in a better situation in comparison to an egalitarian variant.

Rawls' concept was first used in the intergenerational context by Talbot Page (1977). In his approach, fairness meant not favouring any generation. The only kind of wealth distribution acceptable to everyone irrespective of the generation they belong to is one that provides everyone with equal chances, where no generation lives at the expense of another.

It may be proven formally (Bucholz, 1997) that fair wealth distribution across the generations will be achieved if the relevant decisions are made 'behind the veil of ignorance'. However, this assertion does not guarantee at all that fairness in the actions of the parties involved may be ensured in practice. Therefore, although we know that there is a theoretical solution to the issue of intergenerational equity, we may never be able to implement it.

It is worth noting that David Pearce (1987) went much further in his interpretation of Rawls' principle, extending it to interspecies equity. Here the construction of a global order 'behind the veil of ignorance' would consist of ensuring equal chances for every species. However, Pearce's idea should only be viewed as an intellectual exercise because the materialisation of an appropriate convention of this is of course impossible.

Although applied by economists in various ways, Rawls' approach in itself does not belong to economic theory. The theory employs the notion of utility as a means of meeting human needs, and uses the notion of discounting in inter-temporal comparisons. Any value that is to be realised in the future, including utility, should be discounted from the vantage point of the current period that is reduced by a factor related to the distance in time. At the same time this factor depends on the preference attached to it

by a particular person in the present and expressed as a discount rate. The inner objection felt by many towards discounting future events is understandable, yet this does not change the fact that the existence of discounting in human behaviour is verified empirically and attempts to ignore have led to illogical nonsense and arbitrariness in economic policy (Żylicz, 1989, pp. 81–87).

Therefore, the criterion for choosing a development path based on conventional economic analysis should be derived from the postulate of maximising the sum of discounted utilities that will correspond to successive generations:

$$\sum_{t=0}^{\infty} \frac{u_t}{(1+\delta)^t},$$

where u_t is the utility ensured for generation t, while δ is the discount rate.

However, it is easy to verify that an optimum calculated this way cannot fulfil the sustainability postulate; at any fixed positive discount rate it 'pays off' to sacrifice the welfare of future generations in favour of the welfare of a previous generation. This result is quite obvious so sophisticated mathematical methods are not necessary to envision it. By preferring the present itself to the future, conventional economic analysis contradicts the essence of sustainable development in principle.

3.3. Formalised approaches to intergenerational equity

Graziela Chichilnisky formulated an interesting idea, now known as the Chichilnisky criterion, which uses a combination of the sum of discounted utilities and the limit by which the (undiscounted) utility of future generations is approached:

$$\alpha \sum_{t=0}^{\infty} \frac{u_t}{(1+\delta)^t} + (1-\alpha) \lim_{t\to\infty} u_t,$$

for $\alpha \in [0,1]$; where, as noted above, u_t denotes the utility ensured to generation t, and δ is the discount rate.

If a decisive weight is given to the first component of this combination (the α parameter close to 1), the result will approximate the conventional optimum, and hence the development path will not be sustainable. If on the other hand, decisive weight is given to the second component (the α parameter close to 0), this result will only influence the welfare of generations in the distant future, while the present one will have no significance.

The very essence of the Chichilnisky (1996) approach is included in the theorem that all development paths in accordance with any reasonable definition of sustainability may be derived from the abovementioned criterion after the application of α and 1–α weights, although the δ discount rate may not be fixed: it must approach zero over time. Therefore, intergenerational equity may be introduced as part of the economic analysis, but only as a very particular case of optimisation of resource allocation, and after the adoption of some non-evident assumptions.

Based on Rawls' theory, intergenerational equity can be achieved as a result of an agreement that stands no chance of practical materialisation whatsoever. Based on economic analysis, the postulate of equal chance for all generations may only be justified by applying quite arbitrary assumptions. Who is qualified to decide on the value of the α weight? Who is qualified to designate the rate by which the δ discount rate should decrease? Economics seeks to be an empirical science verifying its assertions through research based on observations of reality. It would be possible to imagine a test that would allow an estimate of the α parameter as a manifestation of a preference for

conventional calculation based on the discounting technique, as opposed to a preference for the distant future which contradicts the discounting principle. However, the assessment of future δ rates remains pure speculation because the world still lacks the individuals whose preferences they can be used to express.

Those scientific disciplines widely expected to provide answers to many difficult questions are helpless against the issue of intergenerational equity and the basis of the sustainable development concept. Both in Rawls' approach and in economic theory, intergenerational equity analysis is troublesome and highly unconvincing for many people. Yet some of them accept the postulate of sustainable development as obvious per se.

Why is it that many people support the postulate of intergenerational equity (at least verbally), although it extends to a future so distant that makes it difficult to explain by natural concern for offspring? Clearly, the postulate must be in accord with inner beliefs that people cultivate without regard to scientific or political foundation as many derive their conviction that intergenerational equity is needed from religion (Żylicz, 2001).

3.4. Indicators of sustainable development

As far as economists are concerned, what matters is the ability to statistically confirm the sustainability of development. The concept of a '*green*' domestic product, in contrast with alternative indices based on non-economic indicators, is deserving of particular interest. Even if the latter serve well to convey some detailed issues, it is the first concept that conveys the idea of a function of social welfare that aims to capture society's general position. However, it is easy to ridicule the idea of a single index when referring to issues such as 'flight safety' or 'patient health' because these cannot be characterised in a sensible manner by a single number. Indeed, the more complex the subject of research, the more indices are needed to characterise its position. Nevertheless, we are often intrigued by basic such questions as 'is the economy developing in a sustainable way?' to which we would like a simple answer 'yes' or 'no'.

Economists use the term 'utility' to capture the sense of '*meeting people's needs*' as in the classic definition of sustainable development. This notion goes beyond what is included in statistical analyses based on the Gross Domestic Product (GDP). GDP-related reporting focuses on the assumption that welfare is limited to the consumption of goods and services that are available through the market. Yet not all that defines welfare may be purchased on the market. First, many services are provided by households to their members directly. Second, some goods or services are derived directly from the natural environment. And third, welfare is also influenced by psychological factors, such as subjective feelings of justice, social coherence, and a sense of existence, etc. Unlike the market value of consumed goods and services, utility may reflect the above constraints when it includes phenomena that fall outside market valuation.

However, thus should not lead to the conclusion that GDP should immediately be substituted by alternative indices. One important advantage of GDP is its independence from arbitrary assessments. The statistics include physical figures, while prices are determined by markets. There is little or no room for arbitrary manipulation by researchers. Conversely, many other welfare indicators are arbitrary in their nature, even if some researchers are unaware of it. For example, the standard welfare indicator unrelated to GDP is a combination of a GDP-like index (such as the consumption of certain goods and services) and several other indices which reflect social welfare (such as the availability of certain medical services, life expectancy, and the amount of green areas per capita, etc.) (Moldan and Billharz, 1997; and in Poland: Borys, 1999). All of these

indicators are indeed important elements of welfare, but the resulting numbers depend on the repertoire of elements included and the choice of units. Any choice of units implies the weight that a researcher attributes (perhaps unknowingly) to given elements.

Of course there are procedures aimed at liberating such complex indices from their arbitrary nature, yet they lack any scientific foundation. Any expert opinion, as well as statistical grouping or standardisation method frees the researcher from a sense of guilt of deliberate manipulation, but by no means renders their actions as objective (Kobus, 2002).

Sustainable development is equivalent to balanced development. Naturally, the idea requires specification as to what should be balanced with what. It is widely believed that economic goals should be balanced with social ones within natural constraints. This seems to be a reasonable approach, although as ever it is not free from arbitrariness. First and foremost, it is worth noting that the key role being granted to nature. Natural constraints are simply to be kept; it is impossible to deplete natural capital partially, in exchange for better implementation of some economic or social goals. This is why this concept shares much with strong sustainability or even eco-development. (It is no coincidence that an important organisation, the Institute for Sustainable Development, is called the Institute for Eco-Development in Polish.) The balancing itself requires an assessment of whether or not the prospect of economic benefits justifies bearing some social costs and vice versa. Any attempt to quantify this type of assessment would require attributing certain weights to the elements of such calculations, bringing the discussion back to economics.

One concept that is popular globally is that of an ecological footprint. Many people link it to sustainable development, although the mere calculation of indices itself has nothing to do with sustainability (Wackernagel and Rees, 1996). The ecological footprint ascribes to each good and service a land area used in their production. Hence, a person who for example, eats 100 kg of potatoes per year is an indirect user of the land where the potatoes were grown. The use of cotton clothes also requires the 'occupation' of an area of land. The same is true for the construction of a house, recreation by the lake etc. Additionally, burning coal for the purpose of heating or riding a train drawn by a steam locomotive translates into hectares of forest needed to absorb the resulting carbon dioxide emissions into the atmosphere. The methodology seems convincing until confined to production within one economy. However, contemporary humanity consumes many imported goods and services. Unfortunately, no statistical data are available that would permit a precise association of imported articles with their places of origin, much less the appropriate hectares. In order to overcome this difficulty, averaged indices have been adopted, but these undermine the calculations' accuracy (Stachowiak, 2001).

However, the difficulties related to calculating the ecological footprint are of minor importance when compared with its practical meaning. Estimates always show the ecological footprint of citizens of rich countries to be larger than the ecological footprint of people from poor countries. Or that the ecological footprint of city dwellers is greater than the land they occupy while the contrary is true for people living in rural areas. These are hardly thrilling statements, as it has been known for centuries that people tend to specialise: some produce goods that require greater input of one type of resource and sell them to others, who use mostly different resources to produce something else. Equally revealing is another general piece of advice motivated by ecological footprint research: people put less pressure on the environment when they live more modestly. Such research does not offer practical guidance on the appropriate taxation or other economic regulations.

Of similar relevance is the practical role of other indices associated with sustainable development, for example the Human Development Index (HDI). This was designed to replace GDP and uses indicators such as life expectancy, illiteracy, and numbers of dentists per 10,000 citizens etc., all of which leave aside market transactions (UNDP, 2008). However, this as it turns out is completely arbitrary, and the final figure may be freely manipulated by adding or subtracting certain elements, changing their units or assigning different weights. Even if a researcher resorts to some more objective criteria, the outcome will still indirectly attribute relative weights to particular elements, which do not necessarily reflect people's preferences (as in economic analysis) or the chances of maintaining sustainability (as in the science of sustainability).

Yet another approach is based on the notion of critical natural capital (Ekins et al., 2003). Here, the assumption is that substitution among different welfare elements has limits: the lack of one resource may not be compensated by the availability of another. The principal reason for researching critical natural capital is the identification of certain minimum or safe levels of availability of the natural resources that are critical to maintaining sustainability. This is a promising field of research but it will be quite some time before a commonly accepted set of indices is agreed upon (Ekins, 2003).

The only welfare indicators defensible as coherent with economic theory are those based on GDP, such as the above 'green GDP'. This is granted to GDP variants where amendments have been made in favour of environmental factors that are not included in the standard GDP approach. Before we look at this more carefully in section 3.6, we first have to refer to the economic concept of welfare on which it is based.

3.5. The concept of welfare in economics

In economic theory, the welfare of an individual consumer *i* is represented by a function of utility $u_i(x_i,G)$, where x_i represents the individual consumption of private goods (i.e. purchased by all consumers, though perhaps in different quantities) and G is the consumption of public goods (identical for all consumers by definition). Since the mid-20th century, economic theory uses the Bergson–Samuelson social welfare function $W(x_1, ..., x_k, G)$, where consumers are numbered from *1* to *k*. No conditions are imposed on the *W* function except that if all consumers prefer some variant to another, then *W* must also indicate that variant as favoured. This principle may be formalised in the following way: If for every $i=1,...,k$ $u_i(x'_i,G') \geq u_i(x_i,G)$, then $W(x'_1,...,x'_k,G') \geq W(x_1,...,x_k,G)$ as well. This general definition of the Bergson–Samuelson function does not enable it to predict how a change that is beneficial to some consumers and detrimental to others will influence overall welfare. Additional assumptions should be made to permit further conclusions.

Economic theory specifies many particular forms of the social welfare function. Three of those are especially common in research (for more on this see any advanced microeconomics textbook, for example Mas-Colell et al., 1995, pp. 825–828).

1. Bentham's function (utilitarian welfare function):
   $W(x_1,...,x_k,G) = \alpha_1 u_1(x_1,G)+...+\alpha_k u_k(x_k,G)$, gdzie $\alpha_1,...,\alpha_k \geq 0$
2. Rawls' function:
   $W(x_1,...,x_k,G) = \min_i\{u_1(x_1,G),...,u_k(x_k,G)\}$
3. Nietzsche's function:
   $W(x_1,...,x_k,G) = \max_i\{u_1(x_1,G),...,u_k(x_k,G)\}$

The functions differ in terms of the assumption on how social welfare depends on the welfare of individual consumers.

Bentham's function assumes that social welfare increases when consumer *j* records a decrease in utility, provided that consumer *h* records a higher increase in utility (taking into consideration the α_j/α_h ratio). If Bentham's function is adopted with identical α coefficients ($\alpha_1=...=\alpha_k$), which corresponds to the assumption that no consumer is favoured over any other, it can be claimed that social welfare will be maximised when resources are allocated to consumers who value them most. On the other hand, Rawls' function assumes that social welfare is equivalent to the welfare of the consumer who is worst off. According to Rawls, changes in the welfare of consumers who are relatively better off have no influence on social welfare. Improvement is only possible when the welfare of the most disadvantaged consumer increases. Conversely, Nietzsche's function (rooted in the anti-egalitarian views of this German philosopher) assumes that social welfare is equivalent to the welfare of the consumer who is best off. Based on Nietzsche's function, resources would have to be allocated so as to improve the position of those who are best off, even at the expense of those who are worse off.

These examples of social welfare functions illustrate the flexibility of economic theory in studying social and economic changes. It provides the analytic tools irrespective of researchers' political beliefs. Bergson–Samuelson social welfare functions may reflect any given resource allocation system which are both purely egalitarian and entirely the opposite.

Therefore, economic theory may adapt to any kind of relationship between social welfare and the natural environment. The way in which the latter influences the satisfaction derived from the consumption of both private (x_i) and public goods (G) may be the subject of research. In particular, economic theory does not take any stand a priori on the issue of 'privatisation' or 'socialisation' of services derived from natural resources. For example, demand for clean water may be satisfied either by improving the quality of natural water reservoirs (i.e. the supply of a public good) or by developing a market for bottled water (i.e. the supply of a private good). In the first method, all consumers are influenced, since by definition here everyone has access to a public good. The second method satisfies first and foremost the needs of those who value clean water the most, since demand is satisfied by means of individual purchase; therefore, not all consumers necessarily purchase the same amount.

The *W* function is sometimes simplified so that it is not sensitive to the consumption by particular persons ($x_1,...,x_k$), but the sum of $x_1+...+x_k$ and a distribution parameter. The role of a distribution parameter is often served by the Gini index of income concentration. GDP may be viewed as the simplest variant of a welfare indicator which does not include distribution.

Most controversial are issues related with researching the impact of the natural environment on future welfare. Some decisions are made based on current preferences although they will influence future generations, whose preferences are not known. For instance, decisions on spatial planning and in particular, the ones that determine the ratio between built-up areas and wilderness areas are made with no knowledge of the actual preferences of future generations (see chapter 10).

There is no agreement among economists whether the environment is a so-called luxury good, a good for which demand grows faster than consumers' income. Whilst some evidence suggests that this may in fact be the case, nevertheless, there will never be a fully satisfying and universal answer to this question, because we will never be able to foresee the preferences of future generations.

3.6. Greening the conventional GDP

Returning to the concept of GDP, in its simplest definition it contains the value of all newly produced goods and services. Though used by economists for many generations, it was only formalised in the 1930s. The purpose of its establishment was the quantification of global demand in the economy in order to better control the business cycle. It fulfilled this task so well that both economists and common citizens began to view it as a general indicator of economic activity and welfare, although created with a different aim in mind.

The excessive use of GDP in pretending that it is indicative of what it cannot be an indicator of sparked criticism which also came from the vantage point of environmental protection. Critics argue that 'GDP counts what does not count and does not count what counts', suggesting that it is not an accurate indication of welfare. Indeed, GDP does not depend on the state of the environment: the improvement or deterioration of the latter may have no influence whatsoever on GDP. What is worse, the production of certain goods, for example soundproof windows, may rise causing an increase in GDP, while welfare decreases due to the aggravation by outdoor noise. A similar effect may be observed when GDP increases as a result of the production of pesticides which are used to counteract weakened ecosystem resistance. Analogously, an oil spill from a tanker may imply an increase of GDP as a result of the cost of the rescue operation.

The difference between gross product and net product is also of importance. In theory, the distinction is simple gross product comprises of all newly produced goods, including ones that are to substitute amortised or eliminated capital. Yet the elimination of capital causes society to become impoverished. Eliminated capital should therefore be subtracted from newly produced investment goods, and the result termed Net Domestic Product (NDP). Thus, NDP comprises only those investment goods which do not simply serve to substitute used capital, but increase it. Although NDP seems to be a much better indicator of material welfare, economists do not trust depreciation statistics and hence the ubiquitous use of GDP continues. Anyone with experience in accounting knows how arbitrary amortisation rules can be because they do not necessarily reflect actual capital depreciation.

Public opinion demands some quantitative indicator of economic activity and GDP has gained wide acceptance in this role. Therefore, many environmentalists strive to render it 'green'. Some have suggested excluding protective goods from GDP, as in reality they do not improve welfare but rather prevent its loss caused by environmental damage. For instance, the production related with combating oil spills should be excluded from GDP. However, this is not a satisfactory solution, since the qualification of products into two disjoint categories of those that improve social welfare or those that only prevent its loss must be arbitrary. A third category of doubtful products would have to emerge, which would include for example computers that may both improve welfare and protect from its loss. Hence, any corrections that are based on common sense should be treated with caution (Dasgupta and Mäler, 2001).

It was not until the last two decades of the 20th century that economists developed a coherent concept of how to supplement GDP (and NDP) in order to systematically include environmental protection. The concept is based on the approximation of a hypothetical Bentham's welfare function W using linear approximation. The original W function does not necessarily have to depend linearly on the consumption of private or public goods, which would render its operationalisation difficult even if the defining formula was known. The reality, however, is that the formula is not known, which

makes the situation even more difficult. Nevertheless, if certain mathematical assumptions (of which there is not room to discuss here) are met, the unknown function may be approximated with a linear function that is the sum of the products of the quantities and equilibrium prices (Aronsson, 2000):

$$\text{Domestic product} = p_1 q_1 + \ldots + p_n q_n,$$

where $p_1,\ldots,p_n$ are the prices of n goods and services produced in the economy and $q_1,\ldots,q_n$ are their quantities.

Hence, adequately defined NDP may be interpreted as a linear approximation of an unknown welfare function. The problem amounts to deciding which products to include and what prices to ascribe to them. Additionally, it can be shown that in the case of many goods, their market prices suffice (cleared from subsidies and taxes). Alternative valuation methods should need to be sought only for non-market goods, including environmental protection.

Appropriately green NDP is thus similar to its traditional prototype except that some goods are systematically omitted in the sum (if they do not improve welfare), while others are systematically summed up (if they improve welfare but are neither sold nor bought on the market), and the prices are not always derived from the market directly. The starting point for this is green GDP which is the sum of consumption, savings and environmental services consumed directly (and not purchased on the market). Green NDP is then calculated by changing gross values to net values: instead of counting all savings only those that increased capital value should be taken into consideration, and environmental damages should be subtracted from the value of environmental services (i.e. the costs incurred in order to compensate the environmental benefits lost).

Capital value and net savings deserve particular attention because in contemporary economic theory, there are three main capital components: man-made, natural and human. Each of them may be depreciated and each of them may be restored through investments. The depreciation of natural capital may occur as a result of for example raw material extraction, loss of biodiversity or environmental damage. Therefore, green NDP leaves out income due to the sale of capital, including natural resources. In line with contemporary economic theory, not all that is colloquially called 'income' is income in fact (Aronsson, 2000, p. 585). Ever since the publication of Hicks' (1939) fundamental study, economic income is understood as the flow of income that is sustainable in the future. In other words, the cash from selling a house is not income, as it is the result of a single transaction and the owner simply replaced one form of wealth with another, whilst on the other hand house rental may provide income.

In the context of environmental protection, it may be claimed that income is what emerges from the sustainable use of resources. If the use of resources is not sustainable, the resulting depreciation of natural capital should be taken into consideration. The concept of 'green' NDP captures the essence of Hicks' income and includes the notion of sustainability.

In summary, 'green' NDP as discussed above differs from its traditional counterpart in three ways. First, it includes the direct consumption of environmental services. Second, it adds investments in natural resources or subtracts their depreciation. Third, it subtracts environmental damages. After such corrections, the index reflects welfare changes better than GDP, but still remains only an approximation of their true level.

Numerous practical attempts to calculate green GDP have been undertaken and one of the best-known initiatives of this type is the Index of Sustainable Economic Welfare

(ISEW), defined and calculated for the United States by Daly and Cobb (1989). The most significant conclusion from these calculations was that contrary to what was shown by traditional GDP statistics sustained economic welfare in the United States stabilised at the 1970s level and stopped growing. If 'green' NDP decreases or increases at a lower rate than the traditional index, it means that the economy is not developing in a sustainable way. In other words, the current generation seeks to meet their own needs to the detriment of the chances of meeting similar needs in the future. Returning to the example given earlier, if people sell a house (which could serve the next generation to come), they may improve their own welfare, but at the expense of their children's. Daly and Cobb's calculations suggest that that is exactly what happened in the United States in the last quarter of the 20th century.

Similar calculations were conducted in Poland in the 1990s by Gil and Śleszyński (2003). In line with expectations, the growth rate measured by ISEW was lower than indicated by GDP. However, the American and Polish studies show both theoretical and practical shortcomings of the ISEW methodology. The latter were caused by the lack of statistical data needed to calculate the costs of environmental degradation and the benefits of improving its state. If the necessary data are lacking, the methodology permits the approximation of their values using the costs of environmental protection. Such an approach raises questions, since changes in these costs do not necessarily reflect changes in environmental damages; it would be legitimate only if environmental policy was conducted at a socially optimal level. In fact, researchers have tried to avoid resorting to environmental protection costs in subsequent ISEW applications. A more fundamental computational problem stems from the fact that raw GDP data (corrected in the process of its 'greening', as explained above) are later multiplied by an income concentration coefficient. Moreover, the less egalitarian the distribution of income, the smaller the resulting ISEW will be. This is supposed to reflect an assumption of the general theory of the Bergson–Samuelson social welfare function W, that not only the sum but also the distribution of individual wealth may influence W. Nevertheless, the use of a certain indicator of income concentration typically the Gini index is arbitrary in nature and reflects a type of social philosophy recognised by the authors of ISEW. In particular, this may reflect a common assumption that individual utility functions are concave. Although the direction of the analysis itself may be defendable, the choice of the specific forms of these functions must remain arbitrary.

3.7. Sustainability and the scale of actions

The term sustainable development now enjoys incredible popularity. Relevant programs are prepared not only by government ministers but also by lower-level authorities, such as corporate boards and local authorities. Unfortunately, these programs are often problematic since descending below the global economic level implies many insolvable issues.

Most obvious are problems related with the documentation of companies' sustainability. Although big corporations appoint vice presidents in charge of sustainability and publish appropriate reports, the matter is entirely discretionary. A furniture producer strives to document that the wood used for production does not originate from illegal forest felling, a textile plant tries to document that the cotton was grown in accordance with environmental protection requirements, or a book editor assures that no chlorine was used for paper production. However admirable and verifiable these claims may be, they do not guarantee sustainability. Since not all corporate actions may be verified

accordingly, a company's 'sustainability' is a notion that cannot be determined using the categories involved in the sustainable development of economies.

There is a tendency in business to conduct life cycle assessments of products (LCA; tool 5.T1). For instance, car companies develop that their new models to not only use less fuel, but also be easier to disassemble. This might be the sign of a step in the right direction, but economics is familiar with rebound effects which undermine the accuracy of such predictions. The improvement of a product's feature (for example its energy efficiency) promotes an increase in demand, which in turn causes the final effect to differ from earlier estimates. The first economist to notice this was William Stanley Jevons (1865), who rightly predicted that improved energy efficiency of the steam engine will initiate a wave of new applications, leading to increased coal extraction.

To illustrate the rebound effect, we can use the example of a hybrid car (Kahn and Vaughn, 2009). Toyota is proud of its Prius car model that consumes slightly less fuel than conventional vehicles thanks to state-of-the-art technology. Yet more detailed research urges caution towards the optimistic assessments of the car. First of all, the Prius tends to be bought by American consumers who are rather well-off and already have at least one other car. Moreover, a car that is more economical in use encourages drivers to make longer journeys. Taken together, this leads to higher, not lower fuel consumption, a classic example of the rebound effect. Second, perhaps even more pessimistically, people tend to buy the car with the aim of joining an elite club of the virtuous and preoccupied with the fate of our planet. The ownership of a Prius is, in a way a visible sign of 'greenness', which allows drivers to have a clear conscience and allow themselves not to behave as correctly as they would otherwise. Are these the most appropriate efforts in the drive towards sustainable development?

Detailed research on the rebound effect confirms its existence in practice, with its magnitude depending on various factors. Usually, the more mature the market, the weaker the effect, which may explain why a study on Prius sales in Switzerland (De Haan et al., 2006) found no rebound effect. In general though, the scale of the effect depends on numerous factors that may be easily predicted only to a very limited extent (Sorell, 2007). This is why LCA results cannot be depended on uncritically in documenting the step towards sustainability, especially in countries with poor economic development.

Still, it would be premature to discredit all efforts aimed at putting some order in everyday life. As a result of the 1992 Global Summit in Rio de Janeiro, a catalogue of actions towards sustainable development, known as Agenda 21 have been adopted. Local Agenda 21s are also being developed at regional level and even among small communities (chapter 9). These efforts have an undoubtedly beneficial role in raising concern and responsibility for our planet. However, they cannot replace actions at national and global level, which are necessary to avoid fictitious problem solving by transferring problems elsewhere or causing rebound effects. 'Common sense' is necessary, but it should not replace a deeper reflection on the complex interdependence of economic and natural systems.

3.8. Summary and conclusions

Sustainable development may be understood in many ways. Economists prefer the Brundtland definition, whereby the issue amounts to meeting needs as an area studied quite thoroughly in their discipline. This does not at all imply ignoring non-material needs, including life in a non-degraded natural environment, which are no more real

than the need for food and shelter. The most difficult matter is the establishment of a satisfactory approach to intergenerational equity. According to the definition, meeting present needs should not occur at the expense of future generations, yet the preferences of these generations are not known and must therefore be adopted arbitrarily.

Assuming the stability of preferences over time, it should be possible to statistically assess sustainable development. Numerous indicators may be applied, yet only few meet common sense or theoretical requirements. The 'greening' of GDP allows a measure of social welfare without having to adopt arbitrary assumptions on the relative weights ascribed to particular aspects of human preferences. It is not the only alternative that has been tested by economists after GDP was found not to reflect welfare accurately as there is also a strong tendency to analyse physical flows as representative of the quality and intensity of economic activities (Ayres, 1998). The latter approach is best expressed in the concept of critical natural capital. However, while such alternative indices are interesting and sometimes even justifiable, 'green' NDP remains closest to what politicians and experts analysing the relevant policies are familiar with.

The main theoretic advantage of 'green' NDP is its relatedness to the notion of sustainable development. Its sole definition renders the index sensitive to natural capital depletion and by analogy it reacts positively to investments in environmental quality. These characteristics cause 'green' NDP changes to be symptomatic of improvement or deterioration processes of long-term economic growth perspectives. Furthermore, when compared with conventional GDP indices, it allows us to conclude whether or not the current generation is acting in a sustainable manner or is consuming the capital that it should be passing on to subsequent generations. If 'green' NDP is lower than the traditional index, it means that the present generation is depriving its successors of their chances to meet their own needs. If the opposite is the case, the current generation is accumulating wealth that its successors will be able to use. Therefore, 'green' NDP is not an indicator of current wealth because a low or decreasing index is a signal that the current generation is living at the expense of its successors, although its own welfare may be high, perhaps even increasing.

Many issues have yet to be resolved before it is possible to calculate 'green' NDP. Of those, one of the most difficult is the valuation of non-market goods, such as clean air, soil, or biological diversity. Economists use hypothetical or surrogate markets in order to estimate the prices that may not be observed in real-life transactions (Shechter, 2000; see tool 1.T1 and case study 1.C1). For example, in order to estimate the value that people attach to silence, one can analyse the differences in prices of real estate stemming from different noise levels in their respective neighbourhoods. Similarly, in order to estimate the value that people attach to preserving species, researchers create scenarios of hypothetical protective indicators that could be undertaken and ask people how much they would be willing to pay for these measures to actually become reality. The obtained values may be doubtful, but in the last few decades enormous progress has been made in their reliable assessment.

One important issue remains unresolved however, is it possible at all to assess sustainability with a single index? Sustainability is a complex, multidisciplinary and multifaceted matter, which makes it impossible to express with a single figure. Therefore, rather than pursuing one comprehensive index, the focus should be on a set of indicators (section 9.3). Economists, however, have a tendency to seek aggregated values that serve to approximate human perception of certain phenomena. Since sustainability has already secured a stable position in political minds and programs, the return of

fundamental questions those that require a 'yes or no' type of answer should be expected. Hence, if there was a need to determine whether an economy is developing in a sustainable way, it would be worth using a complex index, regardless of the use of a whole set of sustainability indices, not all of which may suggest the same direction. A number of such (complex) indices could be proposed, but most of them are characterised by the sin of arbitrariness, be it due to the selection of elements or the adopted weights. The concept of 'green' NDP surpasses the problem of arbitrariness and is closest to what many would recognise as sustainable wealth.

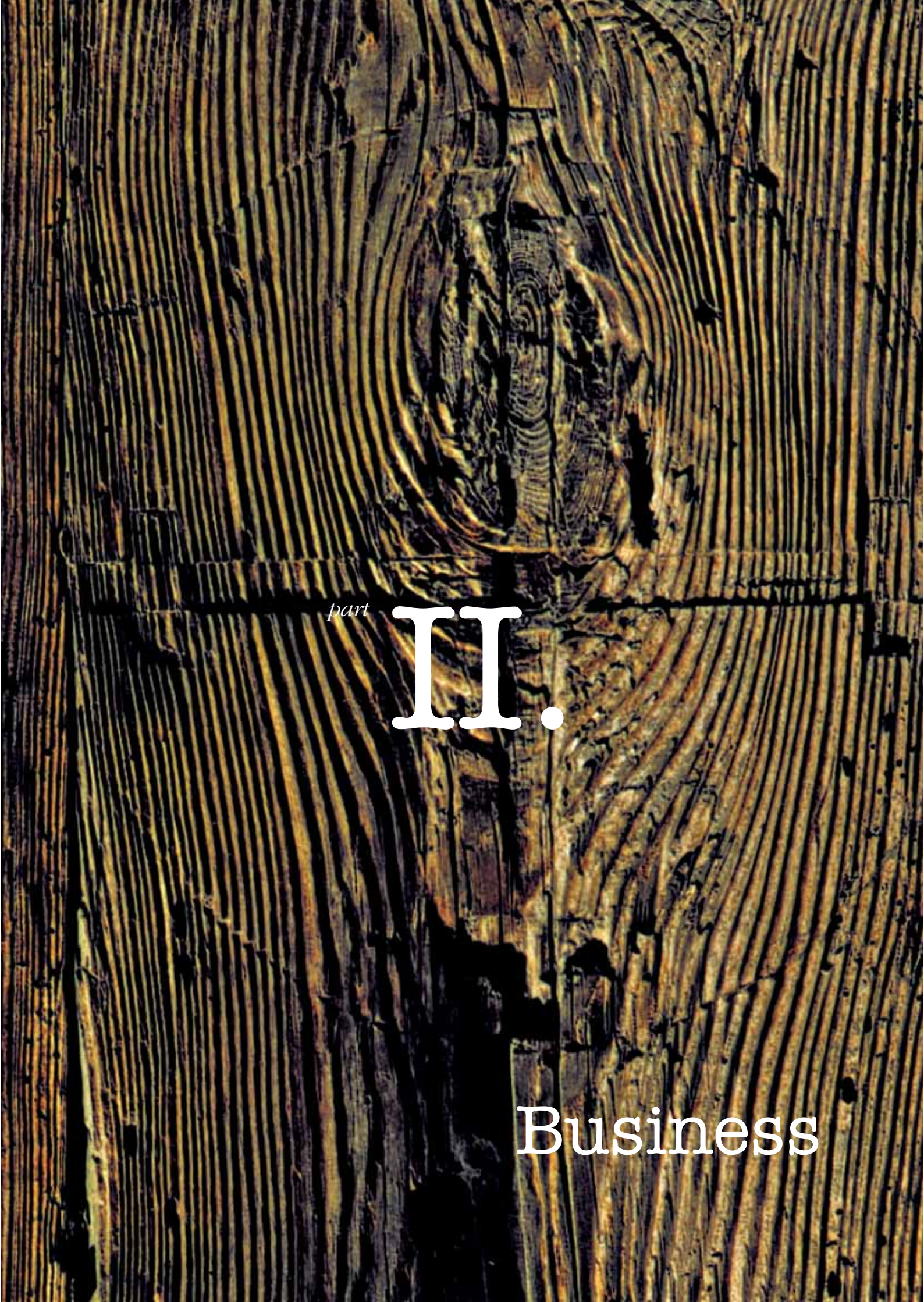
Practical resources

Folmer, H., Gabel, L., Opschoor, H. (eds) (1995), *Principles of environmental and resource economics*, Aldershot: Edward Elgar (published in Polish in 1996). A textbook in which theoretical aspects of sustainable development are complemented with practical examples.

Żylicz, T. (2004), *Ekonomia środowiska i zasobów naturalnych*, Warsaw: PWE. A Polish textbook to environmental and resource economics with numerous questions and tasks (with answers).

Questions

1. What is the difference between sustainable, balanced and eco-development?
2. Is the Herman Daly's concept a version of 'strong sustainability'?
3. Can discounting, a technique applied in economic analysis, be reconciled with sustainability?
4. What sustainability indicators are used in practical applications?
5. Why do economists object to the Human Development Index?
6. What defects of the traditional GDP can be eliminated as a result of 'greening' it?
7. What is the rebound effect and why is it relevant in the sustainability context?



part

II.

Business

Introduction to part II

'*Global companies have no future if the Earth has no future.*' This statement was made by Ryuzaburo Kabu, the honorary chairman of Canon (cited by Laszlo, 2003, p. 5), and reflects the dependence of the economy on the environment that we referred to in part I. This of course can be extended to other companies, even the smallest, and indeed also to other organisations and individuals. In case study 1.C2, we witnessed a similar regularity, '*without fish there would be no fishermen*'. Additionally, in case study 2.C1, we saw the opportunities that emerge from environmental protection when we consider the socio-economic system in the sufficiently long term.

The core idea of long-term thinking regarding economic activity, and thus sustainable development, was well expressed in 1923 by John Maynard Keynes in his famous assertion: '*in the long run we are all dead*'. Keynes meant that at the time of a storm, one cannot be consoled by the fact that the ocean will eventually become calm, because by that time all those at sea would be dead. Thus, Keynes urged us to take early actions that would protect us from the storm, change its course and effects, and eventually let us enjoy the welfare achieved.

Environmental protection and social interests are important for those in business seriously thinking about their long-term activity. They understand the indispensability of resources and energy taken from the environment, alongside the ecosystems' ability to absorb and neutralise pollution resulting from economic activity (figure 1.1b). If businessmen reduce the accessibility of natural resources in the future, or if they reduce the regenerative capacity of the environment, the conditions for their future activity deteriorate. Although it may be possible to move their activity to a different sector, this means re-establishing their market position from scratch, which is costly and limits profits.

The fact that business depends on society was described well by Porter and Kramer (2007), stating that to be successful, companies need a healthy and well-educated society, with equal opportunities ensured for all. Safe products and working conditions not only attract consumers and employees, they also reduce the costs of economic activity. A well-educated society is able to create competent institutions, including a legal system that is crucial for innovation and efficiency. Finally, a healthy and wealthy society provides the demand for goods and services that are offered by businesses. Therefore profits that companies make through activity at the expense of society are illusory and in any case short-lived.

Taking into consideration the relationships above with regards to business, we associate sustainable development with corporate social responsibility (CSR). Both concepts demand perceiving business activity in a broad and long-term context. Although in this part of the book we mostly emphasise the economic arguments for adopting this approach (including cost reduction, pressure from public opinion, consumer demand, and new opportunities for business activity), are also justified according to ethics (Chappell, 1993; Chryssides and Kaler, 1993).

Ethics were traditionally perceived as one of the pillars of responsible business. Indeed, many managers declare that they take responsible decisions based on their own moral or religious beliefs, or from their previous social activity. In business, ethics comprise of beliefs, norms and values, and other forms of moral dictates which we know that should be followed. The most elementary of these include notions of honesty and transparency. It is on these that one builds trust, a foundation for the long-term functioning of a company. In recent years, many cases of unethical business behaviour have been revealed, such as 'creative accounting', misleading advertising campaigns,

corruption, conflicts of interest, and hiding reprehensible behaviour of global corporations in less developed countries by activities via efforts in creating a positive image in developed countries. As a result, companies started to highlight the ethical dimension of their social responsibility through all their communication channels. Their activities aim at building trust among consumers, business partners and other stakeholders. Thus, businesses demonstrate that ethical activity pays, just as much as responsible behaviour in general.

Businessmen who understand the challenges above posed by sustainable development and are able to meet them to their benefit are the leaders in their field. We use their examples throughout this part of the book.

To illustrate the challenges and opportunities related to implementation of sustainable development in business, we use a causal loop diagram depicted in figure II.1 (we introduced this kind of diagram in section 2.3). Of course, figure II.1 represents a simplified picture and it might further be expanded to cover a larger number of interactions. However, for the time being let us concentrate on the most important of these.

Often consumers think lowly of business activities with regards to sustainable development. This is because consumers have growing expectations and have a growing social and environmental awareness in general. In effect, consumers object to reprehensible business practice, sometimes deciding to boycott the products and services of companies that perpetrate it. In response to consumer pressure, companies undertake activities aimed at sustainable development, eliminating some social and environmental problems, as a result of which consumer pressure abates (balancing loops B1a and B1b).

Business is under pressure not only from consumers but also from other stakeholders. These include: the local community, business partners, employees, trade unions, banks and other financial institutions (such as insurers and analysts assessing financial risks related to various investments), the media, non-governmental organisations (NGOs), public officers, social control institutions, and competitors. Therefore, companies need to identify these stakeholders, their expectations and enter into dialogue with them, an important element of their sustainability management system (chapter 4).[1] In this context and throughout this book, we often refer to the social participation that warrants such activities (as in chapters 1, 9, 10 and 15, and in particular in the case study 1.C3). On the business side, this refers to letting various stakeholders have a say on the company's activity and, in particular, relations with its direct surroundings. This participatory process can manifest itself as common committees and commissions created for the purposes of making different decisions in consultation with external stakeholders. In reality as we shall see in chapter 7, most activities that companies undertake in the area of sustainable development are influenced by different stakeholders and not result from the companies' own initiative (Esty and Winston, 2009, p. 68).

Sometimes, in response to pressure exerted by consumers and other stakeholders, companies undertake only token activities (known as greenwash and bluewash), illustrated by the balancing loop B2. Instead of significantly changing their activities, companies increase their public relations efforts, and try to present themselves in better light. Although these activities can improve business image, they also involve a high level of risk. If they are unmasked, the business image can suffer severely. With wide access to information the world over via the media and independent bloggers seeking sensational news, and in the light of the increased social and environmental awareness

[1] An analogous sustainability management system can also be discussed in the context of local authorities (see chapter 9 and Borys, 2003, pp. 250–279).

of consumers, the likelihood increases of revealing that companies do not meet their own declarations, or that their declarations are not adequate. In tool 14.T1, we present some basic principles that are worth following when assessing business activities with regards to sustainable development. Furthermore, the different rankings of responsible or 'sustainable' companies require critical analysis. Sometimes, these ranking are based on data provided by companies interested in being listed themselves. In particular, one should be wary of rankings in which companies have to pay to be listed in a way that is primarily for a source of revenue for the institution that creates such a listing.

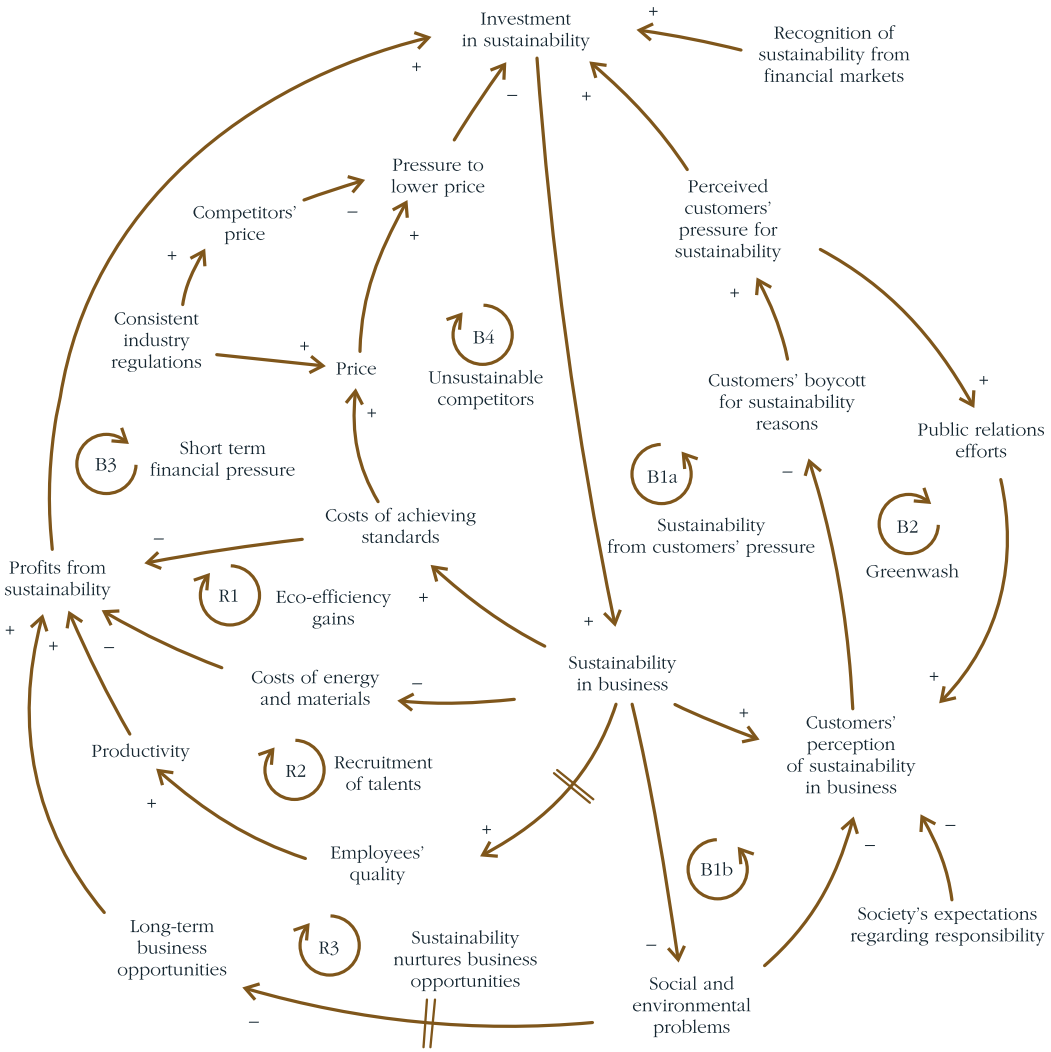


Figure II.1. Challenges and opportunities for companies undertaking activities in the area of sustainable development (Piotr Magnuszewski and Jakub Kronenberg)

However, increasingly often companies undertake activities in the area of sustainable development because they do see the potential benefits that they might bring and not only as a response to external pressure. One of the most obvious motives is cost reduction related to increases in resource and energy efficiency i.e. eco-efficiency (reinforcing loop R1) which can refer both to production (chapter 5) and construction of buildings (chapter 6). After all the economic benefits related to efficient use of resources were perceived since the inception of the Industrial Revolution, and in many areas even earlier (Desrochers,

2000). Thanks to these activities, companies reduce the costs of compliance via regulations, not only fulfilling legal requirements but exceeding them; anticipating future threats, preventing them; and meeting customer expectations (chapter 7).

Recognition of business activities in the area of sustainable development makes companies that undertake these activities a more attractive employer (reinforcing loop R2). Both present and potential employees associate themselves with corporate values that also enhance their own self esteem. Eventually, this leads to increased productivity, both directly through higher engagement, and indirectly through reduced turnover of employees and recruitment costs.

As we mentioned above, sustainable development requires a long-term approach. In the long term social and environmental problems may negatively affect companies by reducing demand for their products and services, and restricting access to the resources needed in production. Alternatively, social well-being and a clean environment improve business opportunities, illustrated by reinforcing loop R3.

However, to benefit, one first has to invest because companies have to bear the costs related to higher social and environmental standards. These costs can constitute a barrier, in particular from the perspective of a pressure on short-term gains, experienced by many companies from their owners, such as shareholders (balancing loop B3). Laszlo (2003, p. 7) has commented that the management boards of large companies can rarely afford to run the risks related to innovative sustainable development activities. In extreme cases, if they do give out short-term profits, they can be taken to court by their shareholders. Although this refers primarily to the American market, it shows that smaller companies managed by their owners, and principally those that are not publicly listed, may find it easier to contribute to sustainable development. IKEA for example is such a company, where the owner decided not to make it public, so short-term shareholder expectations would not undermine the long-term strategy of the company (case study 7.C1).

Pressure for short-term gains is further strengthened by market competition, and this includes competing with companies that do not fulfil the requirements of sustainable development. In particular, this applies to situations where social or environmental policies in a given market are not restrictive. So when undertaking sustainable development activities in this situation, companies put themselves at a short-term disadvantage in comparison to their competitors. This in turn can reduce their incentive to behave in a responsible way (balancing loop B4). Therefore, coherent and restrictive policies imposed on companies by governments have an important role to play in promoting sustainable development.

In this context, the policy makers' approach of favouring companies that express their views louder (via stronger lobbying) over those who are innovative, constitutes yet another obstacle to sustainable development. At the end of October 2009, during the discussions on the European Union fund for combating climate change through increased energy efficiency in developing countries, the Polish government strongly negotiated a payment that was the smallest contribution. Although in general, this reflected the position of Polish companies, this also led to criticism of the Polish government's undermining of the EU's activities aimed at preventing global warming. In a statement issued on 30 October 2009, the Business Centre Club, an influential business organisation, asked the rhetorical question: *why should environmental threats in Poland always be treated as a series of national disasters, rather than as a challenge for the Polish economy?*

Lack of government support for innovative companies in their sustainable development activities related was not only specific to Poland. In the United Kingdom, during a joint conference for business and government, on the 14th of September 2005, company

representatives demanded stricter environmental regulations, while the government refused to do so. However, stricter rules would increase even the short-term competitiveness of companies that undertake sustainable development activities although as government officials explained, this could disadvantage other, less innovative companies (*The Guardian*, 20.09.2005).

In both of the above examples, the government's approach was contrary to the arguments in building a long-term competitive advantage for the countries and companies that we highlight in this part of the book (Porter, 1991; Porter and van der Linde, 1995a,b). However, in other instances, governments are more supportive of sustainable development, including the offering of external funding for innovative companies (in chapter 8 we look at an example of an innovative strategy of replacing products with services). The aim of these funding programmes is precisely to increase the competitiveness of EU economy, keeping in mind that sustainable development is an overarching objective. In Poland the most important examples of such funds available companies include:

- EU structural funds, in particular the Regional Operational Programmes (priority 3) and the Innovative Economy Operational Programme (priority 4);
- the Eco-innovation programme, primarily directed at small and medium enterprises, run by the European Commission's Executive Agency for Competitiveness and Innovation;
- the LIFE programme which supports initiatives aimed at reducing the negative environmental impacts exerted by companies; and
- EU research programmes.

One of the crucial factors that can promote business activity in sustainable development is recognition by financial markets. This does already occur with indices used in various stock exchanges which reflect the performance of companies that fulfil their selected sustainability criteria (the best known examples are the Dow Jones Sustainability Index and FTSE4Good; and a similar index was created in 2009 by the Warsaw Stock Exchange). Implementing a sustainability management system in a company (as described in chapter 4) suggests that it puts all the relevant issues in order, providing a signal, for example to banks and other financial institutions, that this company poses less liability, compared to others that do not have such a system. In the context of climate change and the related atypical weather phenomena, the insurance industry places particular attention on activities related to preventing the global warming. Traditionally, this sector has been paying attention to also preventing social problems (such as road accidents), which can be explained by the drive to reduce the insurance payments for victims of social and environmental problems.

With this in mind the feedback loops presented in figure II.1 act with different intensity depending on many additional circumstances. However, understanding these basic interactions will help managers formulate more effective strategies for change management aimed towards sustainable development. Also, this can help external stakeholders (customers, NGOs, and decision makers) to better understand the situation which companies are in, and to create an institutional framework whereby business activity for sustainable development can be facilitated.

Before we move on to a detailed description of the selected issues in the following chapters, we need to have a look at the reasons for which activities that aim at sustainable development can also fail (table II.1). Sustainable development brings benefits to companies but only on the condition that they understand their implications and are able to take corrective action early enough to prevent problems. We refer to these in

different chapters, which refer to the different loops presented in figure II.1. In addition to these factors, this book will also discuss the many other issues related to sustainable business management.

Table II.1. Reasons for which activities aiming at sustainable development can also fail (adapted from Esty and Winston, 2009)

Problem	Solution	Section in the book	Loop in figure II.1
Surprise, ignorance, unforeseen consequences of actions, actions referring to problems other than those that are caused by a given company	Studying environmental and social impacts of a company Studying environmental and social impacts of companies cooperating with us in the supply chain	1.4 5.T1 7.2 7.T1	R3
Ignoring stakeholders and their needs	Stakeholder dialogue; identification and consideration of their needs; public-private partnership	1.T3 4.8 13.2	B1a, B1b
Lack of understanding of market needs	Analysing benefits that the company brings to the society; studying functions that are delivered by products and the possible alternative ways of satisfying the same needs	4.3 8.2	
Lack of understanding of the specificity of customers, in particular when it is necessary to change their behaviour	Responding precisely to customer needs; selling functions that customers demand	8.1 8.3 14.3 14.4	
Attempts to solve problems that have already emerged	Preventing problems before they emerge	5.2 5.3 7.3 7.T1	R1
Expecting a price premium related to sustainable behaviour; neglecting the economic part of sustainability	Prices of environmentally and socially friendly solutions have to remain competitive, compared to the prices of other solutions available in the market	1.3 1.T2 5.2 6.2 7.3 14.2	B3 B4
Lack of involvement of medium level management	Involving top management, medium management and all other employees in sustainable development	4.5 4.7	
Entrusting environmental management to single managers, without referring it to the overall activity of a company	Sustainable development has to become a central part of a company's strategy Precise definition of responsibility for various tasks	4.3 4.4 4.C2	
Inertia – people's resistance to change	Motivating, awareness building and promoting involvement	4.5 4.7	
Premature promises and ostensible activities (greenwash, bluewash)	Honest information on activities, continuous evaluation of activities	4.6 4.9 14.T1	B2
Lack of information on activities undertaken by a company	Reporting on activities undertaken by a company	4.9 4.C1	R2

Chapter 4.

Sustainability management system

4.1. Introduction

David Dale who, towards the end of the 18th century, owned a cotton factory in New Lanark, not far from Glasgow in Scotland, was a renowned philanthropist. In an attempt to improve the fate of children from orphanages, he not only employed them (2000 at a peak), but he also ensured their education at 1.5 hours per day. Although this education followed a 13 hour working day, it was still a sensation at the time. When Dale's factory was taken over by Robert Owen, a utopian socialist, the children's lot improved further as next to the factory, the Institution for the Formation of Character was established where children took part in singing and other forms of recreation. A kindergarten was opened and inns were closed, and prohibition was introduced. The working day for children was shortened to 10.5 hours and children under 12 did not work at all (Galbraith, 1977, pp. 29–30). This system was widely perceived as mild, and both entrepreneurs were given as progressive examples of social responsibility.

Nowadays, Corporate Social Responsibility (CSR), which with reference to business can be associated with sustainable development, is understood much more broadly. With the development of our world, preventing child labour has become one of the most fundamental tenets of CSR, currently most often emphasised by companies operating at a global scale, with operations in developing countries. Taking good care of employees, both in terms of working conditions, education and recreation, is one of the four pillars of CSR. The others are: reducing environmental impacts; responsible and ethical behaviour towards business partners, suppliers and customers; and being a good neighbour responsible to local community within which a company operates, so as to receive from them a 'licence to operate'.

The classical management concepts and tools in the areas of environment, health, security, risk and quality assurance are usually not holistically oriented. In addition, they often follow an 'end of the pipe' approach and therefore not integratable to general strategic management, monitoring and controlling systems. Thus, they cannot ensure the management of sustainability. A report by the World Bank for the Polish government (Mazurkiewicz, 2006) identified four key areas necessary for the implementation of a CSR strategy which were:

- an integrated management structure;
- a plan with indicators and a monitoring system;
- employee involvement and education; and
- communication with key stakeholders.

In this chapter, we present the concept of a Sustainability Management System (SMS), which is a systemic, integrative instrument for sustainable business management.[1] It is designed to be based on the level of normative and strategic management which governs the overall corporate policy and orientation. Its goal is to close the gap between strategic orientation and operative implementation. Through its design, it supports and enables the proactive implementation of the company's vision and strategy on all operative levels in an iterative way through a Plan–Do–Check–Act (PDCA) structure. Thus, actions are first planned and then implemented, after which their effects are verified and based

[1] Our description of SMS is based on Strigl et al. (2007).

on this further actions are devised, ensuring consistence with the earlier plans. Continuous improvement requires repeating this cycle so as to make our plans and actions relevant to the requirements of our changing surroundings (figure 4.1; see the adaptive management concept described in section 2.2).

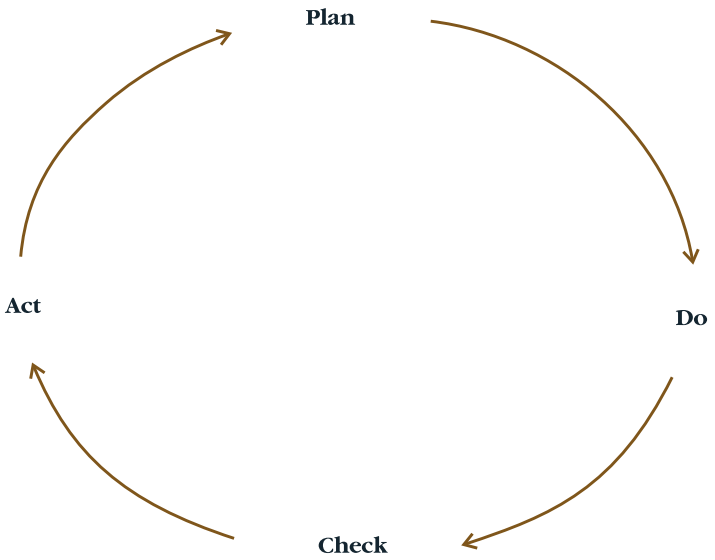


Figure 4.1. Continuous improvement with the PDCA cycle

Since it would be very difficult for companies to orient all areas of the SMS towards sustainable development at the same time, SMS is designed in a way that each component can be implemented separately at any time. While some companies start in the social area, such as community involvement, others concentrate their first activities in the environmental or human resource sector. For some, the sustainable development process starts with writing a sustainability report in which they take stock of all still unconnected individual projects. Designing a vision, strategy and mission statement could be yet another starting point in this process. The important thing is that companies are aware of the importance of all SMS elements and their interaction for orienting themselves towards sustainable development. Their goal should be to implement the entire system.

SMS consists of the following elements depicted in figure 4.2, which operate in an iterative way and which we describe in the following sections, which is preceded by a description of the preparation phase in section 4.2:

- vision (4.3);
- programme (4.4);
- implementation (4.5);
- evaluation (4.6);
- innovation (4.7);
- stakeholder dialogue (4.8); and
- sustainability report (4.9).

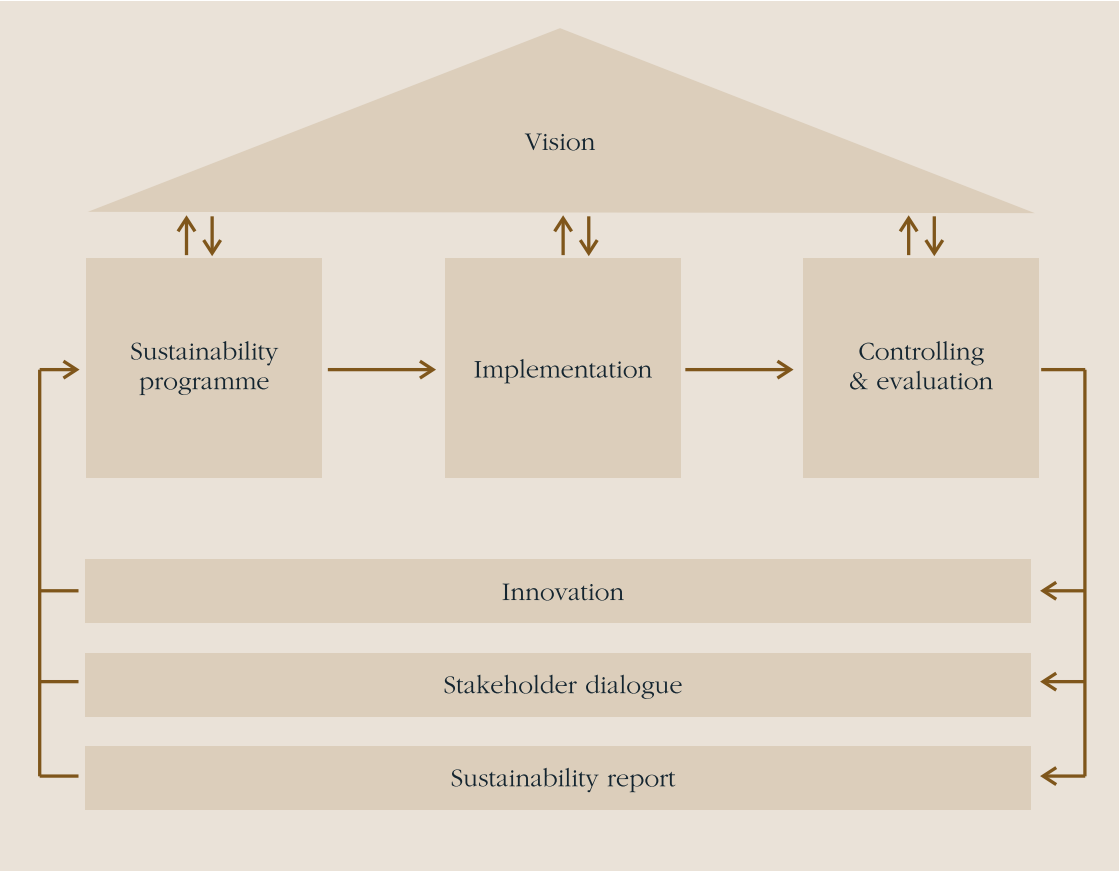


Figure 4.2. Sustainability management system (SMS) structure

4.2. The preparation phase

Before a company can start the iterative loop, a preparation phase is required during which the process is started and an extensive appraisal is undertaken.

4.2.1. Process start

Due to the high strategic relevance of SMS, the process start has to be initiated by the company management. The support and involvement of the management is a prerequisite for the allocation of personal and financial resources. The latter are vital for the successful implementation of the process and the strategic anchoring and prioritisation of the subject.

Awareness building and sensitising the subject with all employees also has to happen at the beginning of the process. This can be achieved through informational events, discussions and communications and educational programmes. One person should take the role of sustainability manager. Together with a sustainability task force, in which all relevant company's departments (finance, human resource, production, communication, and management) are represented, this manager should be responsible for the entire sustainability process. This person has to have the necessary competences (time, money, decisions, and professional qualifications) and should have a substantial personal interest and engagement in the subject.

4.2.2. Appraisal

Taking stock of previous activities in the area of sustainability also needs to take place in the preparation phase. Its goal is to gather and check all issues relevant to sustainable

development and should give an accurate picture of the currents status. The following topics should be part of the investigation:

- organisational structure and divisions;
- existing management systems;
- existing indicators and controlling systems;
- decision making processes;
- stakeholder dialogue;
- internal and external communication, i.e. reports;
- handling of natural resources and other environmental impacts; and
- interaction with employees, and employees contentment.

The result of the current status analyses forms the basis upon which the sustainability orientation with its vision, strategy and mission statement can be developed. The latter provide the roof over the iterative SMS cycle.

4.3. Vision

In order to formulate the general orientation of a company, the societal purpose and the benefits should be clear to all stakeholders. A company should satisfy certain needs of society, such as the provision of goods and services to satisfy people's daily demands. The purpose of a company therefore should not be to make money through products or services that do not benefit society as a whole. In addition employees will find work more rewarding and inspiring when it gives them a sense of purpose. Society, including customers, will reward the company's orientation towards these additional goals (besides monetary profit) in the long run.

Based on the answer to the question of 'what is the societal advantage of our company?', a vision, statement (motto) and values can be formulated. Together, these three elements can be considered the 'constitution' of a company. Therefore, it should have long-term validity and should serve as an orientation for the entire management.

The process of creating the three parts of the 'constitution' can use a number of tools, depending on the preference of the company. A task force representing all major departments of a company could formulate a first draft. The document should then be presented to the employees and even some outside stakeholders in order to seek their feedback. Specific workshops and/or electronic means are good tools for this purpose. The task force will formulate the final vision, motto and values, taking the feedback into consideration.

The company's 'constitution' will serve from then on as a reference for the various sustainability objectives in place. Entering the SMS cycle they can now serve as guidance for the sustainability programme, be implemented in the sustainability process and evaluated in the controlling phase. The results of the controlling phase will form the basis for the innovation and stakeholder processes and serve as a base for the sustainability report. It is recommended that the iterative cycle should be gone through once a year. This does not mean reformulating all elements of the sustainability programme but means, they should be evaluated for their continued relevance and validity.

One of the most recognisable 'company constitutions' is the Johnson & Johnson's Credo (figure 4.3), formulated over 50 years ago by Robert Wood Johnson, chairman of the company's board of directors. The Credo devised obligations and responsibilities for the company towards customers, employees, the community and shareholders. It became a set of guiding principles for all employees in their everyday work. This broad vision illustrates many of the aspects that can be covered in similar documents that are prepared for other companies.

OUR CREDO

We believe our first responsibility is to the doctors, nurses and patients,
to mothers and fathers and all others who use our products and services.
In meeting their needs everything we do must be of high quality.
We must constantly strive to reduce our costs
in order to maintain reasonable prices.
Customers' orders must be serviced promptly and accurately.
Our suppliers and distributors must have an opportunity
to make a fair profit.

We are responsible to our employees,
the men and women who work with us throughout the world.
Everyone must be considered as an individual.
We must respect their dignity and recognise their merit.
They must have a sense of security in their jobs.
Compensation must be fair and adequate,
and working conditions clean, orderly and safe.
We must be mindful of ways to help our employees fulfil
their family responsibilities.
Employees must feel free to make suggestions and complaints.
There must be equal opportunity for employment, development
and advancement for those qualified.
We must provide competent management,
and their actions must be just and ethical.

We are responsible to the communities in which we live and work
and to the world community as well.
We must be good citizens – support good works and charities
and bear our fair share of taxes.
We must encourage civic improvements and better health and education.
We must maintain in good order
the property we are privileged to use,
protecting the environment and natural resources.

Our final responsibility is to our stockholders.
Business must make a sound profit.
We must experiment with new ideas.
Research must be carried on, innovative programs developed
and mistakes paid for.
New equipment must be purchased, new facilities provided
and new products launched.
Reserves must be created to provide for adverse times.
When we operate according to these principles,
the stockholders should realise a fair return.

Figure 4.3. Johnson & Johnson Credo <www.jnj.com>

4.4. The sustainability programme

The heart of every sustainability process is the sustainability programme which includes the following elements (presented in the heading of table 4.1):

- policy;
- goals;
- measures (to be implemented to achieve goals);
- indicators;
- targets;
- responsible employees; and
- deadlines and budgets.

These elements can be organised in various ways and the following examples illustrate the potential categories that can be used to devise the structure of a particular sustainability programme:

- triple bottom line (economy, society, and environment);
- sustainable balanced scorecard (finance, market, process, development, and society);
- company's values (employee participation, decentralisation, diversity, and honesty); and
- the company's departments (management, organisational development, human resources, innovation, supply chain, communication/stakeholder dialogue, and environment).

Table 4.1 reflects part of an exemplary structure of a sustainability programme, using the triple bottom line perspective. The table features sample elements of a sustainability programme, which we describe further below.

Table 4.1. Example of a sustainability programme structure (fragment)

Triple bottom line	Policy	Goals	Measures	Indicators	Targets (values)	Responsible employees	Deadlines and budget
Environment	We are careful and thrifty with natural resources and keep our use of energy and emissions as low as possible	1. Absolute reduction of non-renewable resource use and emissions 2. Internalisation of all environmental external costs 3. Products produced in the least environmentally harmful way possible	1. Replacement of petroleum furnace with pellet furnace 2. Communicating environmental friendliness of products and giving detailed background information on various issues	1. Amount of non-renewable energy sources vs. renewable ones (oil in litres/year vs. tons of pellets/year) 2. Question in stakeholder interviews: are you aware of the absence of negative environmental impacts of our products?			
Society							
Economy							

Policy

A policy is a short directive for a specific area. This policy should be derived from the 'constitution' and be based on the values stated.

Goals

To make the policy concrete, specific goals have to be formulated. In this step, the following issues should be considered:

- high strategic relevance and high quality of each goal;
- limited amount of goals;
- important contribution to the realisation of the policy;
- achievability;
- clarity and understandability;
- balance between short- and long-term goals; and
- balance between qualitative and quantitative goals.

Defining goals one should also follow the SMART concept, suggesting that they should be: Specific, Measurable, Achievable, Realistic, and Time-bound.

Measures

To operationalise a vision, concrete measures have to be formulated, relevant to the goals. Every goal should have one or two measures. If there are more possible measures, one should prioritise them according to the potential for improvement, implementation costs and complexity.

Indicators

To evaluate the achievement of the goals, one has to define indicators. They can either be those which are already used in other controlling systems or they can be newly defined. Since those goals which are measurable get most attention, one should also find ways to measure qualitative goals, for example with questioning methods. Companies that produce sustainability reports according to the GRI (2006) guidelines might find it useful to use the indicators suggested therein.

Targets (specific values)

The target is the desired number and unit. It is advisable to determine the current value and compare it with the value one wants to achieve to ensure and demonstrate continuous improvement. For instance if the goal is reduction of non-renewable resource use (while keeping the required heat value at the same level) and the identified indicator is the amount of non-renewable vs. renewable energy use. In this case the actual could be say 1000 l oil/year vs. 100 kg pellets/year, while the specific required value could be say100 l oil/year vs. 1900 kg pellets/year (1 l of oil is equivalent to 2 kg of wood pellets).

Responsibility

To implement the measures, clear responsibilities have to be assigned. Ideally, only one person should be responsible for each measure. This does not mean that this person has to conduct all the work necessary for each specific measure. He/she can delegate tasks but ultimately the responsibility for reaching the goal and completing the measure lies with this particular person. Such a clear allocation of responsibility makes control efficient and provides transparency within the sustainability programme.

According to a study commissioned by the Harvard Business Review Poland and CSR Consulting (Greszta, 2009), in 2008, 37% of larger and medium sized companies in Poland employed people responsible for issues related to CSR. However, in most cases,

these people were not responsible for CSR full-time but combined it with other tasks related to communication, external relations or human resources management.

Deadlines and budgets

Mandatory, clear and realistic deadlines give orientation, help the evaluation and produce motivation and incentive. As mentioned above, sustainability programmes need short- and long-term goals. One has to bear in mind that deadlines far in the future tend to be ignored until the last moment. As a result, long-term goals are often not met or achieved to an unacceptable quality. Therefore, it is advisable to divide the necessary tasks into interim steps and goals with their own deadlines and responsible people.

Time and money are usually in limited supply in a company. To demonstrate the importance of the implementation of the sustainability process to all stakeholders involved, the responsible people must be given the necessary financial and time resources. This also ensures that people responsible for the achievement of various goals can perform their tasks in a professional manner.

Interestingly, one of the best-known sustainability programmes in the world is the so-called 'Plan A' of Marks & Spencer, the name being very meaningful. Initiated in 2007, this plan featured 100 commitments referring to climate change, waste reduction, sustainable resource use, ethical trade, and promoting healthy lifestyles, etc., to be achieved in a 5 year period in collaboration with the company's suppliers and customers. Later, the plan was extended to cover 180 commitments to be achieved by 2015. Marks & Spencer claimed that it devised this plan in response to consumer expectations, and because of their own conviction that this was how they should behave. It was argued that there was simply no other way to run the company, there was no plan B.

4.5. Implementation

Practice has shown, that an elaborate sustainability programme is a prerequisite for orienting an company in its entirety towards sustainability. However, this does not guarantee that it is enforced throughout the company on a daily basis. Implementing sustainable development requires the identification and enthusiasm of all employees. In order to get the process off the ground and then keep it going, it is vital that all stakeholders see the usefulness and purpose of orienting the business towards sustainability. Awareness building activities are necessary to achieve buy-in into the process.. These can range from educational events and workshops to discourse and communication processes (for example intranet discussion, possibilities to write anonymous emails to the CEO with questions or comments, that the CEO will agree to answer).

Additionally, small short-term activities which not only communicate facts but also address the emotional aspects of sustainable development, can anchor the process in peoples' hearts. For example, employees can be involved in the charitable activities of a company through an employee volunteering scheme so they can have an opportunity of doubling their charitable payments by their employer (pay-roll). Also, employees can be encouraged to behave in a sustainable manner both at work and at home, and this can be achieved through educational activities, such as knowledge competitions.

Furthermore, a company might organise a trip to a site of natural beauty, followed by a visit to another company that begun the process of orientation towards sustainability years earlier. Such a trip could be combined with collective activities, such as tree planting or running a social project in cooperation with a local NGO. This might end with a barbecue, involving collective cooking and eating of seasonal food from the area

visited. These simple projects involve the participants in sustainable development, letting them experience it on their own.

4.6. Evaluation

The verification of the target achievement takes place during sustainability control (Check, within the PDCA structure; see figure 4.1). For all indicators, associated with the various goals, data is being collected, calculated and analysed. This depends on the significance that SMS plays in a company,[2] where it can either incorporate all relevant business indicators or just those which are explicitly identified within the sustainability programme.

Efficient control requires a clear structure for all communications and information flows. It has to be determined which data, from which employees, and in which intervals need to be collected and sent to the controller. In addition, the quality and frequency of the information flow between the controller and other business areas, especially management, has to be stipulated.

For bigger companies, it is advisable to automate these information flows with the help of computer software. This can be used for quality, environmental and sustainability management and supports organisational development through the setting up and continuous improvement of a process-oriented and knowledge-based management system. It may also facilitate documentation of processes and organisational knowledge management, the recording and evaluation of relevant indicators, and the various components of reporting.

The last step in the evaluation phase is to compare the results with the goals of the sustainability programme and determine the lessons learned.

To illustrate how the evaluation helps in improving CSR management, we can use the example of Danone. In 2001, the company created the Danone Way programme which since 2007 has been used as a set of basic sustainability guidelines, called Danone Way Fundamentals. On the one hand, it is aimed at continuous improvement in a set of key areas, and on the other it is used as a platform for introducing an innovation component to any new project. Danone Way Fundamentals consists of 16 principles divided into five areas: human rights, human relations, environmental protection, consumers and CSR management (table 4.2). Each of these principles is complemented with a set of measures that ensure that it is obeyed, and a set of indicators used to verify the progress. Four levels of evaluation have been designed, and each company selects its appropriate level on its own. Internal assessment is part of the broader annual internal control and it is verified by the parent company and an external auditor. In the case of each principle, the evaluation refers to the current

Table 4.2. Areas subject to evaluation within Danone Way Fundamentals (Danone, 2008, p. 31)

Human rights	Equal opportunities, minimum age and absence of forced labour, health and safety at the workplace
Human relations	Working time, social dialogue, compensation and benefits, employee development
Environmental protection	Environmental performance, control of environmental risks, impact of raw materials, impact of packaging
Consumers	Quality management, standards on nutrition and health
CSR management	Ethical code, cooperation with suppliers, cooperation with local communities

[2] SMS can be a management instrument besides others or it can be the overriding instrument into which other tools are fed.

policies, procedures and activities, and very detailed indicators. The scope of assessment is the same for all companies within the Danone group ensuring comparability of results.

The Danone process includes a mechanism of corrective actions, undertaken when a company does not achieve satisfactory results in a given area. In the 2008 evaluation phase, Danone Poland was awarded 854 points (on a 960 point scale) and one of the best results in Central Europe.

4.7. The process of innovation

Based on the lessons learned, the conclusions can be translated into specific actions in the 'Act' phase (figure 4.1). This can happen at all organisational levels and should lead to measures which precipitate renewal and innovations. Innovations are not limited to products or production processes but can occur in other areas as well, such as organisational, social or environmental and can lead to structures which follow sustainability principles (see figure 8.1). Indeed, in many international corporations, sustainability is now being entrusted to innovation departments.

The innovation capacity decreases with an increased degree of formal structure and constriction of a given framework. As a consequence, the creation of a space for autonomy fosters the creative potential and sustainable innovations can emerge. To facilitate the collective creation of innovations and find novel solutions to problems Scharmer (2007) developed the 'presencing' process. This word was created from the words 'presence' and 'sensing'. This process allows for the creation of innovations which are oriented towards a desired future and a vision. It is not based on anticipating the future by extrapolating current trends, but on fundamental changes on how we approach problems. This illustrates an 'adopting a systems perspective' which we presented in section 2.1. Such an approach can be characterised by the following three principles.

1. From judgmental thinking to exploratory thinking. By doing this one increases the range of information and ideas considered. During the process people adopt a humble approach, assuming that they do not yet know the answers and are willing and open to looking at a wider range of possibilities than they did previously.
2. From emotional reacting to sensing. Emotional reacting comes from past experiences and mental models. This limits possible solutions. Sensing is an open, non-judgemental consideration of unconventional solutions which may come from one's inner wisdom.
3. From an egocentric approach to intuitive accession.

Presencing creates the ability and condition to complement our rational thinking with our non-rational kind of knowledge.

4.8. Stakeholder dialogue

Dialogue with stakeholders has become increasingly recognised as highly important and beneficial by companies. It can be a great source of inspiration for innovative products and can help to reduce various risks (economic, social, and environmental) for a company. In contrast to the shareholder-value-principle, which focuses on the needs and expectations of the company's owner, the stakeholder-value-principle puts the business in the socio-ecological context in which it operates and tries to address all needs and expectations of the various stakeholders. A systematic stakeholder management has three phases:

- analyses;
- concept; and
- implementation.

4.8.1. Analyses

Analyses include stakeholder identification and classification. To identify stakeholders internal brainstorming can be used. They can be then classified, based on their proximity to the company (figure 4.4) or on their other characteristics. Stakeholders' ability to influence the company and the company's impact on stakeholders should further be determined. Other criteria which can be used to classify stakeholders include:

- willingness to cooperate;
- potential for conflicts;
- potential for innovations; and
- reputation.

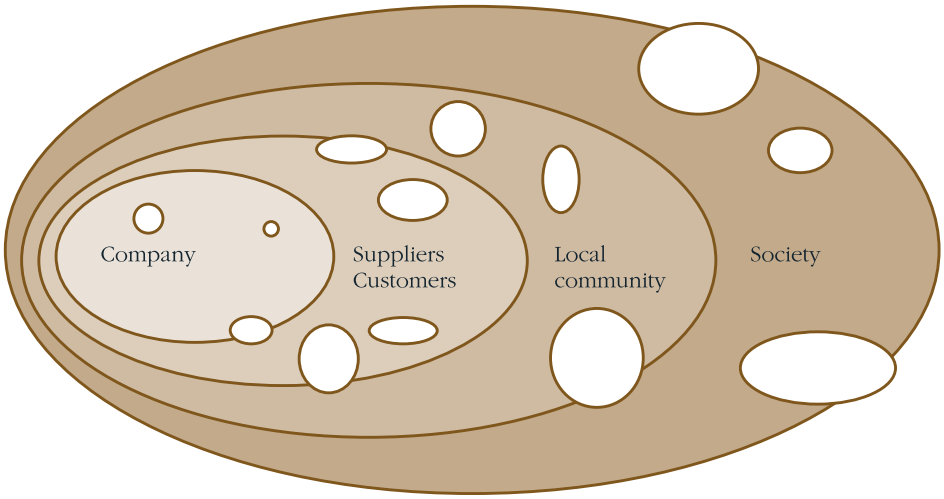


Figure 4.4. Classification of stakeholders according to their proximity to the company (Strigl et al., 2007, p. 26)

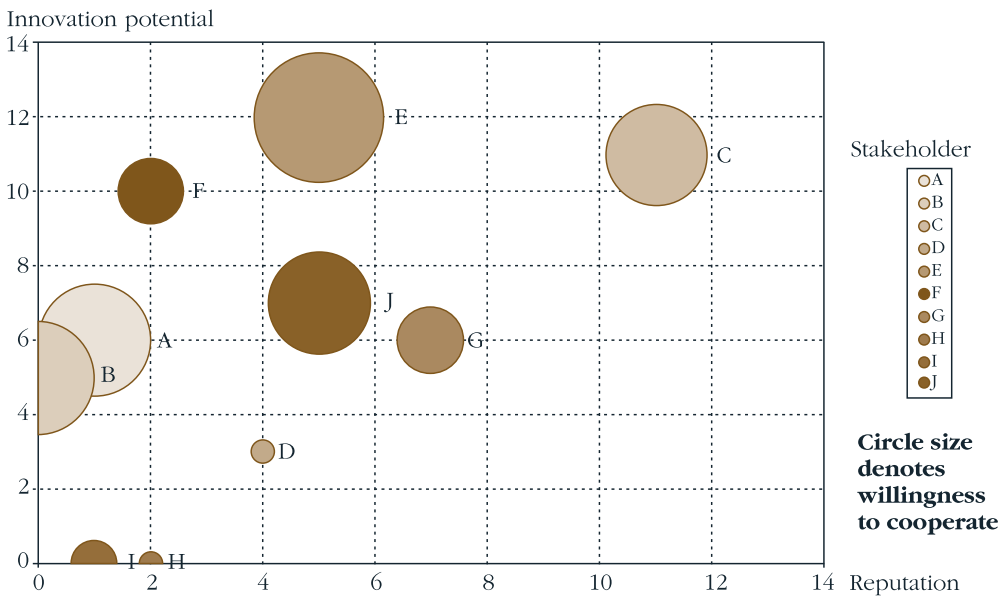


Figure 4.5. Exemplary classification system (Strigl et al., 2007, p. 28)

Figure 4.5 presents a visualisation of the classification of stakeholders according to their innovation potential, reputation and willingness to cooperate. Apart from these

common criteria to classify the stakeholders, one should also identify the reciprocal demands and expectations between the company and its stakeholders. For instance, it is important for suppliers to get paid in time and to have fair contracts. For customers, the criteria might include quality, price, environmental friendliness of products and linkages between the company and their region. For employees fair pay, transparency and corporate culture might be the most important issues.

In order to design an effective stakeholder dialogue, the company should also perform a review of already existing contacts with their stakeholders. The following questions can help with this task.

- What contacts already exist? With which stakeholders do we have active contact and with which is the contact sporadic?
- What is the quality of contact? Is it a one- or two-way communication? Do stakeholders have a chance to be heard and what influence does their input have in the internal decision making processes?
- What form does contact have? Is it personal, such as regular conversations (structured or incidental) with employees, social events, hot lines or professional events? Or is it indirect, involving print media, such as a newsletter or greeting cards, or electronic media only (webpage, internet forums, television and radio)?

4.8.2. Concept

Having analysed the existing stakeholder relationships, one should identify strengths and weaknesses related to those contacts. Based on such an assessment and the study of good-practice examples, an improved or new concept of relationships should be designed. For this, the following questions and their answers might be useful.

- What do we want to achieve with the new concept?
- What can we achieve?
- How big will be the required effort?
- What will happen with the information we get from the stakeholders?
- How often will we have contact with each stakeholder group?
- How do we remunerate each stakeholder group for their engagement?

The answers to these questions provide a foundation for a detailed plan developed for each specific stakeholder group. This plan should have elements similar to the overall sustainability plan, i.e:

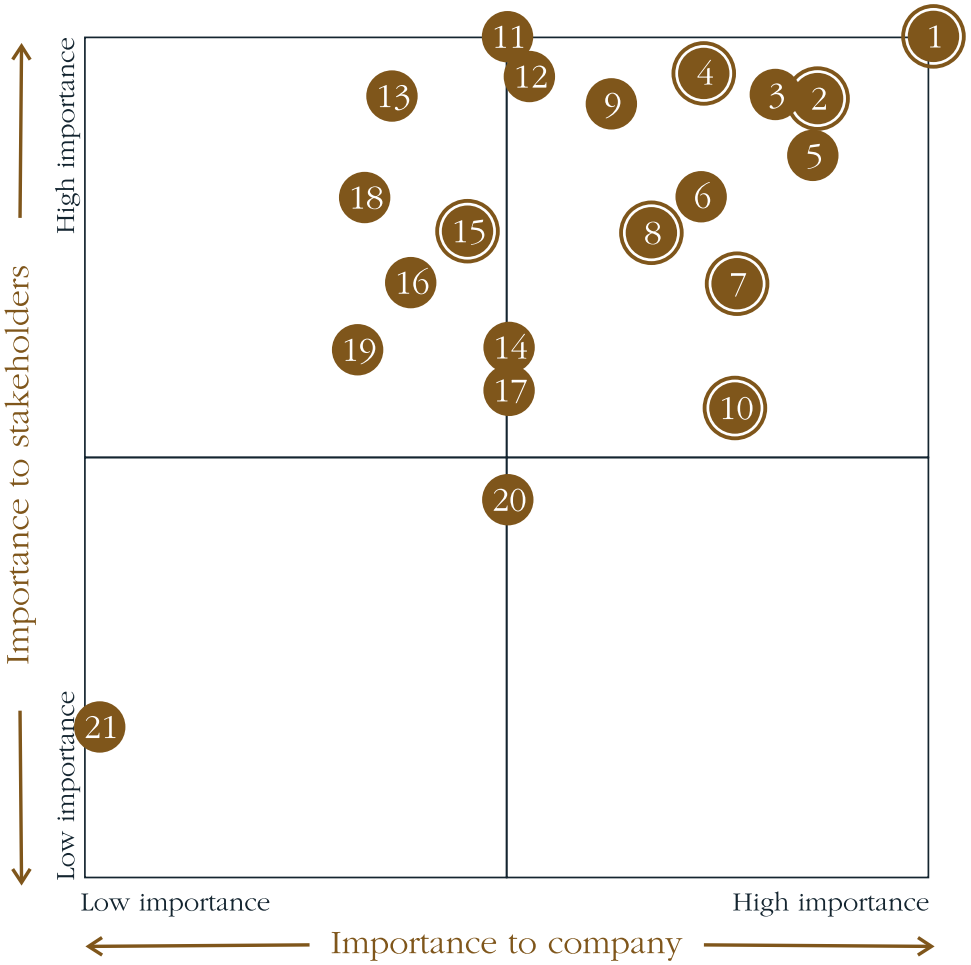
- goals;
- measures;
- indicators;
- targets;
- deadlines;
- responsibility; and
- budget.

4.8.3. Implementation

The implementation of the plan will be the responsibility of the persons identified. They will need to be provided with an appropriate time and financial budget. After about a year there should be, as part of the iterative structure of the process, a review of the new stakeholder dialogue approach. The observed costs and benefits (indicators) should be analysed and compared with the original goals and where necessary, adapted.

A study of stakeholder expectations carried out by Vattenfall in the spring of 2008

provides an interesting example of stakeholder dialogue. The company asked its key internal and external stakeholders to identify the most important issues related to sustainable development and prioritise them. The 58 stakeholders who participated in the study represented different stakeholder categories: financial (capital providers and the owner), business and industrial customers, society (authorities, NGOs, policy makers, potential employees, and academia), and internal (employees and management). The results are presented in figure 4.6.



1. Emissions and waste*
2. Openness and transparency*
3. Corruption and anti-competitive behaviour
4. Community relations*
5. Security of supply
6. Occuoational health and safety
7. Customer service
8. Labour/management relations*
9. Energy efficiency in operations
10. Economic performance*
11. Materials used in production
12. Human rights issues
13. Biodiversity
14. Workforce training and benefits
15. Diversity and non-discrimination*
16. Market presence
17. Investment and procurement practices
18. Gender equality
19. Transport
20. Public affairs and lobbying
21. Marketing communications

Figure 4.6. Stakeholder dialogue at Vattenfall (Vattenfall, 2008, p. 6). Issues particularly important for the company and its stakeholders are marked with an asterisk and are encircled in the figure

Both internal and external stakeholders attributed the highest significance to emissions and waste, which reflected the attention paid to climate change, related to the specificity of the energy sector. Other issues that were deemed important for both groups were: corruption and anti-competitive practices, and openness and transparency. This indicates how important honest and transparent activity should be for the company.

4.9. The sustainability report

Sustainability reports illustrate how companies are embedded in their economic, social and natural surroundings. They describe the institutional anchoring as: the sustainability task force, vision, and strategies. With a sustainability report, a company discloses the progress of all projects related to sustainability and by doing so demonstrates its accountability to internal and external stakeholders. The report should provide a balanced representation of the company's performance, including both positive and negative issues.

The following subjects can be covered in a sustainability report:

- actual and future economic, social and environmental chances and risks (global and local);
- how the company sees its duties and responsibilities within the society and how it is meeting them;
- how the company communicates with its stakeholders in different geographical scales (local, regional, global); and
- which goals of the sustainability programme were reached and to what extent.

In particular the last point illustrates how closely related the sustainability report is with the whole SMS. An SMS is a foundation to which a report should refer, and at the same time the report is an integral part of the SMS. Attention should also be paid to the process of report preparation. A report is most useful for both internal and external purposes when it follows the internationally recognised and widely used the Global Reporting Initiative's Sustainability Reporting Guidelines (GRI, 2006). These guidelines can serve as a support for developing an SMS or as a source of potential indicators. At the same time, the guidelines ensure the external transparency and credibility of the report and its publisher. Additionally, other recommendations might be followed to ensure the process-oriented character of the report (Kanatschnig, 2003).

In Poland, sustainability reporting is a relatively new practice. Two initiatives deserve attention in this respect: The 'social reports' competition and the publication in 2009 of the Polish version of the GRI guidelines. The competition awards the best reports referring to CSR, sustainability, environmental management or social involvement. It was initiated by PricewaterhouseCoopers, ACCA Poland, the Responsible Business Forum and CSR Consulting in 2007. The purpose of this initiative is to promote an idea of sustainability reporting and the best practice in this area.

GRI is a network of stakeholders with the mission to create unified, international reporting standards to be used in reporting economic, social and environmental issues. It also aims at improving the transparency of economic activity and increasing the quality of reports. The first draft of GRI guidelines was prepared in March 1999. During a pilot phase carried out in 1999–2000, the guidelines were tested on a sample of 21 companies. The results of this experiment were discussed by managers and numerous external stakeholders (representatives from academia, NGOs and consultants). In 2002, the second version of the guidelines was prepared, the G2. Four years later, based on further experience and a series of international consultations with companies that adopted this standard, the third version of guidelines was published, the G3. In 2009, the G3 guidelines were translated into Polish.

Whilst the GRI's Sustainability Reporting Guidelines support reporting, in the opinion of many practitioners, they can also be used as a basis for developing a sustainable development strategy or even of the whole SMS. They facilitate the management, monitoring and evaluation of various activities carried out within the sustainability framework. Their universality results from the detailed recommendations on what to include in a report and how to prepare it. The guidelines put forward the principles which should be followed to define a report's contents (the principles of materiality, stakeholder inclusiveness, sustainability context and completeness) and to ensure its quality (principles of balance, comparability, accuracy, timeliness, reliability and clarity). Finally, they provide indicators which can be used in developing a sustainability programme. Quoting the guidelines (p. 6):

Sustainability reporting is a living process and tool, and does not begin or end with a printed or online publication. Reporting should fit into a broader process for setting organizational strategy, implementing action plans, and assessing outcomes. Reporting enables a robust assessment of the organization's performance, and can support continuous improvement in performance over time. It also serves as a tool for engaging with stakeholders and securing useful input to organizational processes.

4.10. Summary and conclusions

In this chapter, we saw what a sustainability management system (SMS) should look like. And what the real situation is in Polish companies? Increasingly, following the example of international corporations, Polish companies have started to implement complex CSR strategies (Greszta, 2008). However, this is mainly only the case of large companies, among which about 1/3 declared having such a plan. 7.6% stated that their strategies were comprehensive and covered all business areas.

However, in light of another study, it was found that CSR activities in Poland are most often initiated by public relations (PR) departments (Wierzbowska and Kuraszko, 2006). Thus, even though the number of CSR-related posts has significantly increased, their responsibilities are most often located within the structures of PR departments. This situation makes a comprehensive approach to SMS implementation difficult.

Referring to the CSR value curve model developed by the IBM Institute for Business Value (figure 4.7), it is difficult unequivocally to place Polish companies on any of the stages of business value growth through CSR. According to this model, while companies move along the curve, CSR becomes an integral part of business strategy and generates increasing revenues. On the one hand, in Poland there is a strong tradition of charity and supporting local initiatives which, however, cannot be associated with strategic philanthropy in the American understanding. On the other hand, many activities are aimed at compliance with current or future regulations (for example resulting from Poland's membership of the European Union); others reflect self-regulation or voluntary agreements signed by different sectors; and still others focus on stimulating efficiency and innovation.

Many Polish companies carry out activities that aim at sustainable development. However, often these activities lack coordination and coherence, and in particular, they lack a strong strategic business approach. As a result, in most cases they are not linked within any SMS that would involve different organisational levels, including top management that would make possible sustainable growth of the company value. Subsequently, we hope that this publication can help to change this situation.

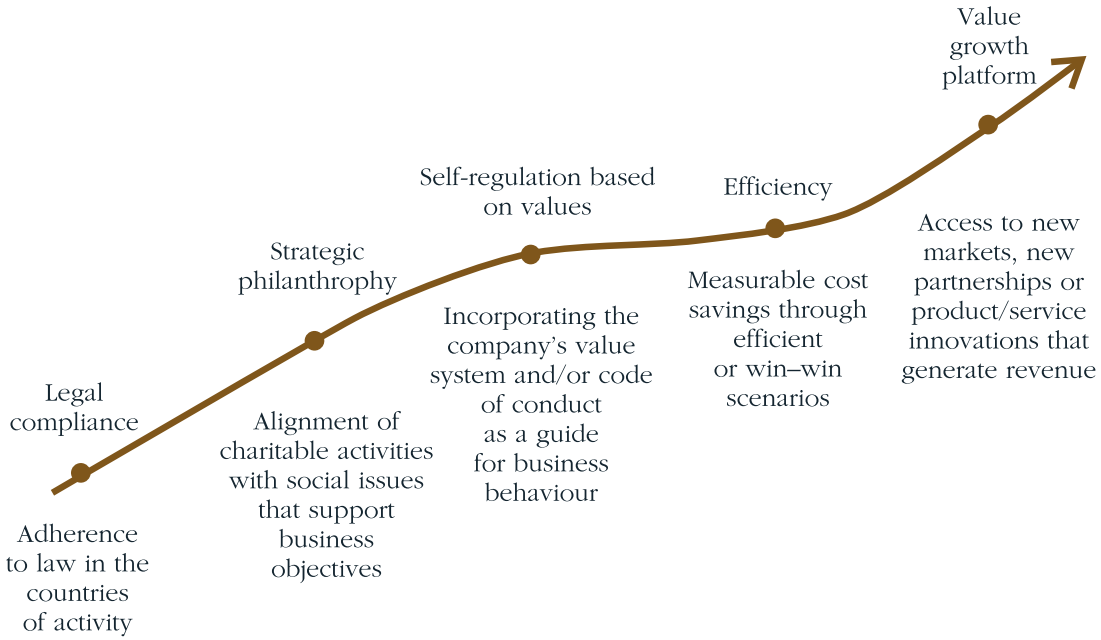


Figure 4.7. CSR and business value curve (Pohle and Hittner, 2008, p. 4)

Practical resources

<www.globalreporting.org> Sustainability Reporting Guidelines of the Global Reporting Initiative.

<www.iso.org/sr> ISO 26000 – an international standard providing guidelines for social responsibility prepared by the International Organisation for Standardisation.

<www.csrinfo.org>, <www.odpowiedzialnybiznes.pl> Portals with current information on CSR and sustainable development in Polish companies, that also featuring guidelines and other educational materials for companies.

Laszlo, C. (2005), *The sustainable company*, Washington, D.C.: Island Press. A book that suggests 'how to create lasting value through social and environmental performance'.

Smith, N.C., Lenssen, G. (2009), *Mainstreaming corporate responsibility*, Chichester, UK: Wiley. A broad set of chapters and international case studies focused on CSR.

Questions

1. Should the sustainability management system be part of an overall management system, or should it constitute an overriding system? What should be the optimum model of sustainability management in a company or other institution in which you work, act or study?
2. Who and how should they be responsible for implementing sustainability/CSR in a company? A CSR department, a CSR manager, a committee at the level of a management board, or a member of the board? What are the advantages and disadvantages of placing this responsibility at different levels? What is the key set of obligations that should be entrusted to such a person or an organisational unit?
3. Is stakeholder dialogue a CSR fad, or is it a condition for competitiveness?
4. Is the publication of a sustainability report a PR activity, or is it an integral and irrevocable part of SMS implementation?
5. Reading the following chapters, think about how the issues that they present fit into an SMS, and where they fit within the structure presented in this chapter.

Case study 4.C1.
The use of GRI Sustainability Reporting Guidelines at the BRE Bank[3]

When it comes to the size of capital owned, the range and magnitude of activities, the variety of products offered and the level of banking technology, the Export Development Bank (BRE) Bank is one of the biggest financial institutions in Poland.

Currently, the BRE Banking Group consists of specialised companies in which the bank is the sole or the major shareholder. Over a dozen of strategic companies, active in the financial services sector, support the bank's individual divisions: corporate banking, investment banking, personal banking and accounts management. The personal banking division includes both the complex management of large funds belonging to the more affluent of the bank's customers (Private Banking and Wealth Management), as well as the services directed at the bank's regular customers who are being serviced via mBank and Multibank which are two of the group's units. In 2006, the BRE Bank celebrated its 20th anniversary.

The BRE bank begun its operations by supporting exports and stimulating the growth of international trade. In 1994, the German Commerzbank became a strategic investor in the BRE Bank. The BRE Bank became a pioneer in online banking by creating, in 2000, the very first fully-electronic online bank, the mBank, offering highly competitive rates to its customers.

A year after mBank was created, the BRE Bank created another outlet aimed at providing personal banking services to the bank's regular customers through MultiBank. MultiBank's business model was from the outset based on one-to-one customer care within a network of local branches, where qualified advisors, supported by an electronic system, dealt with customers' enquiries. In 2005 the BRE Bank rebranded itself taking on a new, modified mission that reflected the wide scope of its activities and its universal approach to banking. It became a self-proclaimed '*best financial institution for corporate, business and individual clients with high demands*'.

BRE Bank's Corporate Social Responsibility Management

The BRE Foundation was established on the 31st of May 1994 to manage the bank's systemic involvement with social and societal issues, i.e. to operate a range of charity initiatives from within one manageable entity, governed by the set of strict rules regarding funding allocation and identification of the foundation's strategic areas of activity.

In the first months of 2008, a new position was established within the BRE Bank's personnel structures, dedicated to BRE Bank's social responsibilities. The position's holder was given responsibilities for setting up of the bank's strategy, initiating and undertaking a variety of projects, cooperating with the third sector and the BRE Foundation, as well as social report writing.

The report

Published in October 2009, the 'BRE Bank Corporate Social Responsibility Report 2008' was the third publication focusing on the bank's interaction with its stakeholders. Until now, the CSR reporting constituted a section of the bank's annual report. The 2009 report is the first stand-alone publication on the social aspects of the bank's activities. It provided an overview of events which have shaped the relationships between the BRE

[3] This case study is based on materials provided by BRE Bank.

Bank, mBank, MultiBank, Private Banking and Wealth Management, and their stakeholders. The importance of those events defined the period covered in the report.

Just as in the previous years, the quantitative data in the report referred to the past (2008) calendar year. However, due to the fact that many important events took place in the first half of 2009 (mainly regarding the bank's relationship with its clients in the face of an economic crisis) the time span of the qualitative data included in the report extended beyond the end of 2008, and continued through to 31 August 2009 (inclusive). The economic crisis, the decline of public trust (especially in relation to banks) and the need for transparency in the face of these factors were all reflected in the title of the report: *Passing the test of a crisis: sustainable development in difficult times.*

The publication was built around four key chapters.

1. BRE Bank – an overview: management and supervision mechanisms, financial results, products range, and target markets.
2. Relationships – a description of specific actions and projects aimed at shaping the bank's relationships with its stakeholders, outline of goals and initiatives directed at the bank's clients, employees, investors, society as a whole, and the environment.
3. Competences – a presentation of the BRE Bank's involvement in aiding the development of students, interns, employees, entrepreneurs and other actors operating in the market.
4. Innovation – illustration of the bank's key values. This chapter was structured around three aspects of innovation:
   - products offer (aimed at corporate and individual clients);
   - the bank's involvement in the funding of innovative initiatives; and
   - encouraging the growth of innovation in the Polish business sector.

A reporting method was developed in 2009 to incorporate the Global Reporting Initiative's Sustainability Reporting Guidelines.

The scope of the report

In comparison to the publications to date, the 2008 report saw a large expansion of the section dedicated to the BRE Bank (and especially to its management and supervision mechanisms). Non-financial aspects of the bank's performance (including customer relations and taking responsibility for the products offered) constituted a prominent feature within the report and represented key aspects of the Bank's operations. Analysis of the BRE Bank's employment strategies and its impact on the environment are also featured in the report.

The report has been developed within the framework of other reports published by the BRE Bank and references to those reports provide an opportunity to further investigate detailed topics. Additional references include a range of internet links directed to websites where detailed information regarding specific issues may be found. Those websites include information about the BRE Foundation (including a full report on its activities), corporate accounts, an mBank blog (including educational materials in the form of articles) and the <www.innowacyjnefirmy.pl> (innovative companies) portal.

The use of GRI guidelines within the report was rated at B+, where the '+' relates to report's verification by an external auditor. Following the GRI guidelines, all indicators regarding the company, the report, supervision structures and the BRE Bank's involvement in the process were presented. Substantial progress had been made in comparison to the previous reports (depicted in figure 4.8). The content of the report

also included sector supplements' indicators for the financial sector. It is worth noting here that the lack of references to indicators from certain categories (such as selective use of environmental indicators) is sector specific and a natural result of specific corporate characteristics regarding its social and environmental impacts.

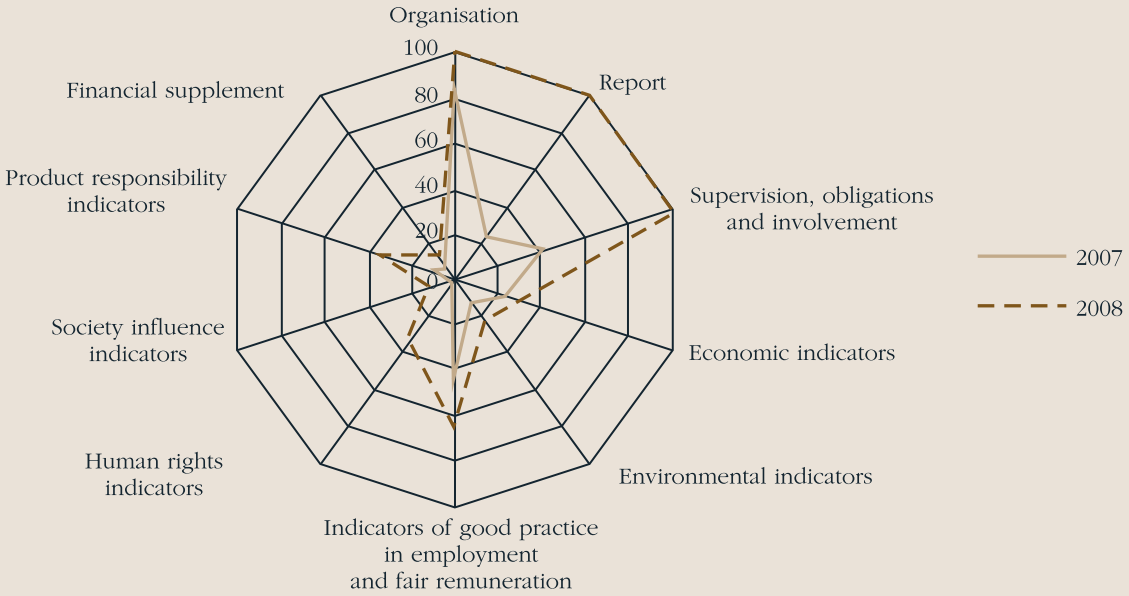


Figure 4.8. GRI indicators included in the BRE Bank's reports for 2007 and 2008 (BRE Bank, 2009, p. 10)

The process of preparing the report

The BRE Bank's CSR Report 2008 crowns the work of a working group established especially for the purpose of creating this publication and coordinated by a CSR specialist. Representatives from a range of bank's organisational units were actively involved in the process of report making and included: the Internal Audit Department, the Monitoring and Accuracy Bureau, the Organisational Development Department, the Logistics Department, Human Resources, Payroll departments, and Human Resources of the Personal Banking division, as well as representatives from mBank, MultiBank and other BRE Bank business units.

Work for the current report was based on an analysis of the BRE Bank's previous reports, as well as its internal strategic documentation and external comparisons with other actors within the sector (benchmarking). Rating guidelines were also taken into consideration in the preparation of this report, based on those of Oekom, the international rating agency delivering data to institutional investors in socially responsible investments (also known as ethical investments).

The activities above were aimed at the following:

- identification of previously disclosed and highlighted issues and indicators (including indicators in line with GRI guidelines);
- recognition of good practice within international CSR disclosure efforts (in line with GRI guidelines);
- preparation of a preliminary list of indicators and issues to be included in the report (with special emphasis on their relevance for the financial sector); and
- spreading the responsibility for particular GRI indicators among the bank's structures.

The analysis phase was followed by a project team workshop. The aims of this workshop were:

- presentation of the GRI methodology to the project team members;
- presentation of goals, phases and key premises of the reporting process;
- securing the support and involvement of the management team and representatives of the bank's key departments;
- collection of information (feedback) regarding the previous report (including both its functionality and factual content); and
- preliminary allocation of issues related to particular indicators to individual organisational units within the company.

The final stage of the preparation phase consisted of a series of meetings with organisational units' representatives, aimed at the preliminary verification of the report's content (a list of indicators and issues to be included in the report). In addition, the meetings were aimed at the broadening of the report's content to include topics and issues which were previously undefined yet were important in relation to the social responsibility of individual units. The existing mechanisms of data gathering, monitoring and reporting were discussed and relevant data identified.

Once the preparation phase has been completed, the data collection phase began, structured around a previously identified list of indicators. The data was then passed on to the project's coordinator, the BRE Bank's CSR expert.

The defining moment in working on the report came with the phase of analysis, data collection and processing for the final publication. The next step was the editorial work regarding the report's text components, followed by the creation of the graphic design for the publication.

Partners and employees play a key role in establishing of the good practice within the BRE Banking Group. Three experts were asked to comment on the report, all of whom had cooperated with the Bank on a variety of projects over the previous year. Those include representatives of the Bank's managerial team and representatives of two non-governmental organisations.

The external audit conducted by PricewaterhouseCoopers (a consulting company) had also preceded the report's publication. The audit was conducted to ensure transparency in the reporting process as well as for the quality and importance of data and issues included in the report and its compatibility with GRI guidelines. Existing data collection, monitoring and reporting frameworks were analysed and tested. The auditor's report could be found in the final section of the bank's report, confirming the factuality of data used, describing the scope of the report, and the content verification process that had taken place.

Conclusions

Looking back, the process of report making and the use of GRI guidelines in this process can be considered beneficial for the organisation. Not only does it allow for the competencies of individual organisational units to be tested, but it also examines interrelations between those units with regards to the aspects of sustainable development covered in the report. It also enables the verification of the stakeholder communication mechanisms. Furthermore, the international GRI methodology was used here to portray a complex matrix of relationships observed between the quantitative (for example client satisfaction measurements) and qualitative (such as customer relations) data.

Communication and cooperation played key parts throughout the process, from introduction of the issues and briefing all team members on expectations for the publication, and collaboration between all the individual units involved. The team's direct involvement in the preparation of the report revealed a broad acceptance of the process amongst the staff through awareness of sustainable development and CSR which had risen, as had awareness of the need for action from both the corporation as a whole and its employees as individuals.

Questions

1. What do you think about this particular process of report preparation? Do you think some aspects of the process should be modified? And if so, what could have been done differently?
2. What do you think about the BRE Bank's decision to abandon the traditional, annual reporting format and include in the report quantitative data for the year 2008 (with a cut off at the end of the calendar year) and the qualitative data for the period ending six months later, half way through the 2009 (which is when work on the report had begun)?
3. What do you think about the decision to split the report into three key areas reflecting the BRE Bank's brand values: relationships, competences, and innovation as opposed to following the more commonly used triple bottom line: the economic, social (internal and external to the organisation) and environmental sustainability factors?
4. Looking at English version of the report that is available at <www.brebank.pl>, how do you assess the bank's use and implementation of GRI guidelines?

Case study 4.C2.
Setting up the 'Sustainable development and corporate social responsibility strategy of the PGNiG Group'[4]

The Polish Oil and Gas Company (Polskie Górnictwo Naftowe i Gazownictwo SA) is a major player on the Polish gas market. Its core activities include exploration and exploitation of natural gas and crude oil deposits as well as import, storage, distribution and trade in gaseous and liquid fuels.

PGNiG is one of the biggest and oldest companies in Poland. Its income and profitability place it among the biggest and most prosperous companies. It is also a major employer in the Polish job market.

The starting point

In November 2008 PGNiG's board accepted the PGNiG Group's business strategy (until 2015). In a parallel process, the company began preparations for the creation of its Sustainable development and corporate social responsibility strategy (hereafter the SD and CSR strategy). From the outset, the second document was designed in such a way as to compliment and strengthen the business goals set out by the business strategy (which covered all aspects of PGNiG's activities). Four areas of CSR were identified: work place, environment, market and local community. The new strategy was aimed at developing a list of specific goals and targets within those. In other words, the strategy was created so as to supplement the business strategy with objectives and developmental directions which were not included in the November 2008 document and which were closely related to the areas of CSR named above.

The work on the SD and CSR strategy had been based on company's mission statement recognising and covering a range of aspects of CSR.

> Our mission is to provide reliable and safe supplies of clean and environment-friendly energy drawing on competitive and innovative solutions designed for the industry. We remain loyal to our tradition and the trust of our customers, whilst looking ahead to new challenges and changes with an open-mind. With the interests of our shareholders, customers and employees as our main priority, we wish to focus on our reliability and transparency as a partner and to develop the Group's values in accordance with the principles of sustainable development.

The Group's CEO and Vice-President for Restructuring and Human Resources were directly involved in the project and took roles as its sponsors, which added to the project's labelling as 'of strategic priority'. This strategic role for the project was strengthened further by the full integration of the Group's SD and CSR strategy with its business strategy.

The work methodology was chosen to allow for involvement in the project of a large group of people, representing the entire array of the PGNiG Group's activities. Encouraged by the actions of PGNiG board members, key personnel responsible for the development of the Group's business strategy came forward to offer their support. The project's managerial structure included a steering committee formed by the directors of key business departments from within the organisation.

A new structural level was developed within the PGNiG management structure, encompassing a matrix of the Group's individual branches, gas distribution units and other companies. Relevant communication and marketing personnel were appointed

[4] This case study is based on materials provided by PGNiG.

to act as the Group's regional CSR coordinators (initially introduced on temporary basis, the positions were made permanent once the strategy was established). The project overall was supported by the external advisor, PricewaterhouseCoopers (PwC).

Data gathering and analysis

In order to establish preliminary organisational characteristics and define the starting point for the SD and CSR strategy development, a range of data was collected and carefully analysed.

The whole process began with a series of meetings between: the project managers; an internal advisor (representative from the company's headquarters); and individuals representing different areas of the Group's operations, such as human resources management, environmental protection, health and safety and customer service. Those meetings were accompanied by a series of visits to a sample of the Group's companies and branches. All of the direct encounters mentioned above facilitated a better understanding of a range of subjects located at different levels and stages of the corporate value chain (from research, through exploration and exploitation, to storage, sales and distribution). They also opened up the project to participants from outside of the organisation.

This initial phase of strategy development was aimed at finding and developing a universal tool which could then be used for the gathering of relevant data from across the organisation (whilst taking into consideration the individual character of the Group's numerous businesses). An extensive questionnaire was created, consisting of dozens of questions, allowing for both data gathering and subsequent unit-based self-assessment, based on activities undertaken, results achieved and management methods used. The tool could also be used to classify specific issues (based on their importance as well as urgency) the classification of which could then be used to identify and define the main impact areas within the Group's corporate value chain. In total 47 units responded to the questionnaire.

There was a period of three weeks (during the data gathering phase) when individual companies and departments were able to receive help and support from internal as well as from the external (PwC) advisors.

Widely recognised global reporting standards (such as the Global Reporting Initiative), sector-specific guidelines and the PwC-developed tools and methods were used in the data analysis stage of this project. Once completed, the results of the data analysis were compared to the results of interviews conducted with representatives of the Group's headquarters (directly responsible for specific business areas within the PGNiG Group). They were questioned on the subject of key issues outlined by the scope of the strategy development project. Their individual responses to the questionnaire were also taken into consideration at this stage of the data analysis.

All of the above measures guaranteed that the full picture of sustainable development and CSR within the PGNiG Group were considered, including the headquarters', and 'field' characteristics and perspectives.

Workshops

The next stage of the SD CSR Strategy development process consisted of a two-day long workshop. Participating in the workshop were the members of the management board, the directors, as well as representatives from the different business units operating within the PGNiG Group. Overall, the workshop had some 160 participants representing operational units from across the Group's value chain, including specialists from business, communication, human resources and environmental protection areas of the business.

Each of the two days targeted specified aims to fully capitalise on the potential of this working group.

During the first day of the workshop, the working group analysed a range of factors located within the organisational value chain. The results of data analysis were presented with reference to some of the best in-line practices in the world (aka benchmarking) and general as well as industry-specific global standards and guidelines. The conditions affecting individual areas and units of the Group's operations were presented at the beginning of the workshop (by the representatives of the relevant units) to ensure that all of those were acknowledged and implemented within the strategy.

Having listened to introductory presentations, divided into thematic groups led by the individuals internally responsible for relevant business areas and aided by the PwC advisors, participants set priorities for their action. These priorities were closely related to specific units of the corporate value chain and embedded within the previously identified areas of CSR. A comparison made between the results of a detailed analysis of to-date practices (together with the level of their implementation) and the activities and results achieved by the world leaders in the sector revealed the need for expansion of the proposed strategy. Further areas were subsequently defined for the purpose of PGNiG's SD and CSR strategy.

The first day of the workshop marked a completion of the data analysis phase, which was aimed at defining the current state of affairs and identifying priorities in the areas of influence.

Day two initiated the next phase of the SD and CSR strategy development and implementation process. New teams were created around the four previously identified key areas of concern: work place, environment, market, and local community. Within each of those, 2–3 sub-groups were formed to conduct a more detailed analysis of specific issues. The sub-groups were working towards the identification of precise points, strategic aims and ways of measuring strategy's success which were then to be used as points of reference in the process of strategy implementation assessment. Specific strategic goals, together with the plan for their implementation, were developed during consultations which involved representatives from relevant departments at headquarters.

The workshop also marked the beginning of the next phase of SD and CSR strategy development process.

Implementation

Conjoined with the results of data analysis, the workshop's outcomes became the foundations for the design of a complete SD and CSR strategy, inclusive of all relevant areas of corporate responsibility and setting out the scope of responsibilities and relationships with other business areas. Included in the strategy were also specific recommendations regarding PGNiG's further actions and future projects (together with indicators of their implementation and completion).

Responsibility for the strategy and its implementation was placed within the PGNiG's annual management by objectives plans, which brought the two strategies (business and SD/CSR) together. The document was officially accepted by the PGNiG management board on the 20th of July 2009. At the same time, the board made a series of decisions regarding its further actions, including those related to the SD and CSR management structures within the Group.

Subsequently, the process began in which the newly agreed strategy was internally communicated across the PGNiG Group. A series of meetings were held in towns around

Poland, bringing together members of the management board with employees responsible for the Group's key business areas. These were the employees who were also responsible for the strategy's main pillars and were involved in the process of the strategies development.

The next phase of the SD and CSR strategy development process required all PGNiG's business units to prepare their individual strategic plans, compatible with the overall strategy but taking into consideration local needs and opportunities. For the purpose of this part of the project, the Group's gas distribution units, departments and other companies were divided into four strategic panels (following the pattern set out by PGNiG's value chain).

Strategic assumptions

SD and CSR strategy of the PGNiG Group refers to six strategic goals (presented in figure 4.9):

- customer care;
- respect for the environment;
- safe and friendly working environment;
- dialogue and cooperation with the social and corporate partners as well as local communities;
- research into new business development opportunities; and
- consistent, accurate and coherent communication and marketing.

Located within those individual strategic goals are operational aims which were to be implemented across the corporate value chain. Consistent communication and marketing is a goal which infiltrates all of the remaining strategic pillars the way shown in figure 4.9.

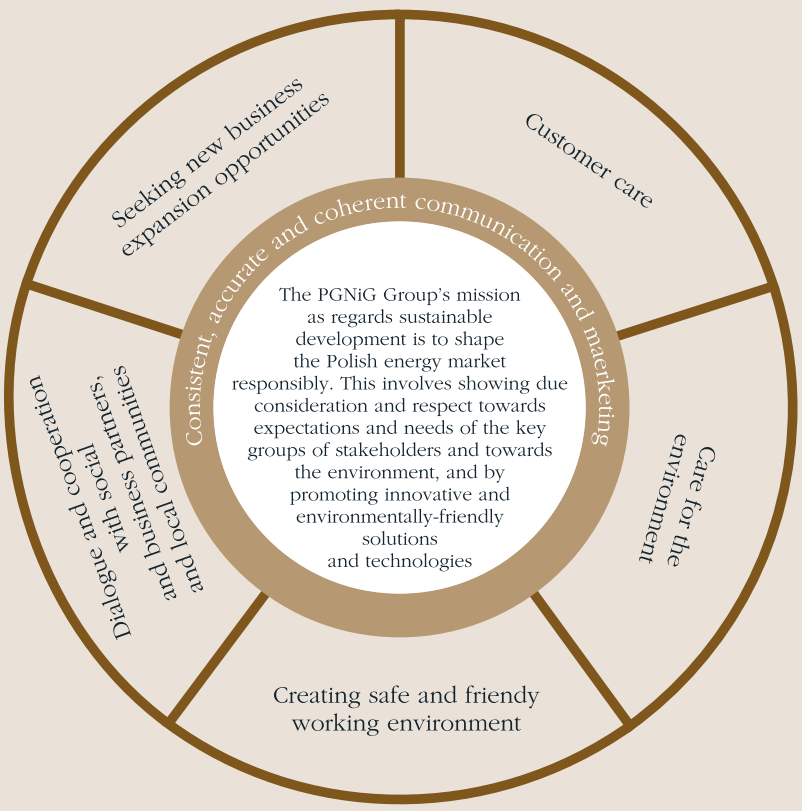


Figure 4.9. PGNiG Group's sustainable development goals (PGNiG, 2009, p. 53)

The operational goals were to be reviewed in 2012, three years after they were originally introduced (in 2009) as a part of PGNiG's effort to implement the complete strategy. The 2012 review would include the evaluation of strategy's progress and identification, definition and agreement on the Group's activities for the following three-year-period of 2012–2015.

In a process parallel to the approval of the PGNiG's SD and CSR strategy, the management board reviewed and updated the Group's SD and CSR management structure. A three-level structure was developed across the Group to assist with the strategy's implementation and pursue the Group's strategic and operational goals (figure 4.10).

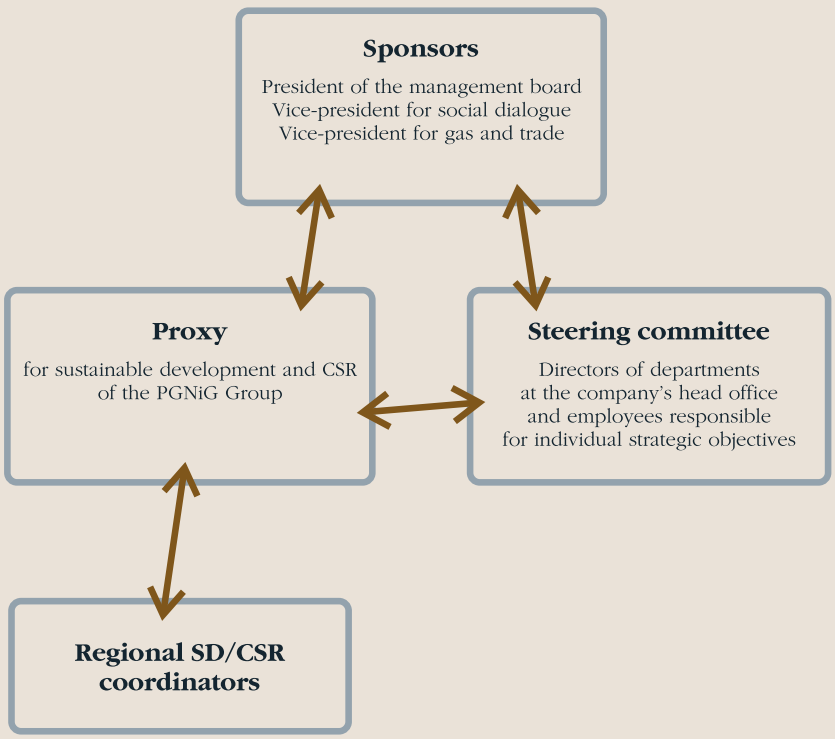


Figure 4.10. PGNiG Group's sustainable development management structure

Within this structure, the management board holds key responsibility for implementation and monitoring of the strategy. It is assisted in this task by the steering committee and an internally recruited organisational proxy on the issues of SD and CSR. The role of the steering committee is to act as an advisor, whereas the proxy is co-responsible for the coordination of strategy implementation across the Group. In practice, this may mean supervision, coordination of implementation, monitoring, reporting and verification of strategic assumptions and goals. At a local level, regional SD and CSR coordinators were co-responsible for the implementation of this strategy at gas distribution units, branches, and the Group's individual companies.

The strategy was designed so that it would be most effective when implemented on a large scale, dealing with PGNiG Group as a whole. However, at the same time, the Group's numerous companies and branches make their own decisions regarding SD and CSR management structures. Therefore they optimise the strategy in a way which makes it suitable for individual units, taking into consideration their specific characteristics, including the varied size of the workforce. The size of the workforce was an important

factor here, as the group consists of companies employing no more than 20 people and others with a few thousand employees.

Conclusions

It is worth pointing out that although the process of strategy development always poses a large challenge (especially within an organisation as complex as the PGNiG Group), this project succeeded in generating a very positive response from the Group's employees. Involvement of both, members of the management board and of the senior management team, proved a key to this success.

Implementation of the sustainable development and corporate social responsibility strategy stimulates organisational thinking on a global scale, within and beyond the competences of individual units and structures. It provides new directions for development and highlights the strategic importance of goals and aims (together with the ways in which they can be executed and achieved). The results of the data collection and analysis phase of this project, as well as the process of cross-unit strategy development have led to the publishing of the group's first ever CSR report entitled *Responsible energy* and prepared in line with the GRI Sustainability Reporting Guidelines (PGNiG, 2009).

Questions

1. How do you view the process of strategy development in the case of PGNiG? Do you think some aspects of the process should have been modified? If so, in your opinion, what should have been done differently?
2. What do you think about the project's management structure: the steering committee, the advisor, the regional coordinators? What benefits and what limitations to such a structure can you identify?
3. What was the role played by the external advisor (PricewaterhouseCoopers) in this process overall? What advantages do you see in a consulting firm's involvement in such a project? What are the pros and cons of setting up a CSR strategy on one's own?

Chapter 5.

Sustainable production

5.1. Introduction: 'let's make the most of every piece of raw material'

'A. Wołkowicz, an engineer, has just turned 70. Maybe it is time to think about retirement and to finally have some rest after years of arduous and exhausting work. These were the thoughts that often nagged the elderly engineer. He used to ward them off and put even more energy into his experiments, promising himself he would have his rest as soon as sponges are produced from the viscose residue' (Peryt, 1956, p. 4).

Describing the activities of 1950s Polish inventors, Antoni Peryt urged: 'let us make the most of every piece of raw material', 'we need to increase significantly efficiency at work', 'we need to fight with all kinds of waste'. He gave numerous examples of using seemingly worthless waste usually to produce 'luxurious goods'. Among them one could find: an acetylene generator made out of old German air bomb trunks, sponges produced from viscose residue, using miller's dust instead of rye flour to tan furs or saving 1 cm of textile when cutting material for each baby's shirt...

Regardless of these endeavours, along with other states of the Eastern Bloc, Poland was among the most energy-inefficient economies in the world. Only in the 1990s did improvements in efficiency become associated with environmental protection. Two factors favoured this situation: a policy focused on internalisation of external costs (increases in storage costs as well as those of resource extraction from the environment; tool 1.T2) and market competition that forced more efficient usage of available resources. Environmental protection became economically advantageous and notions such as eco-efficiency and cleaner production became more popular (Doniec et al., 2002; see section 5.2). Similar factors, in particular increased the possibilities for competing in the more demanding markets of developed countries along with pressure to reduce costs, which influenced the spread of even more complex solutions that were often associated with industrial ecology (Kronenberg and Clift, 2004; section 5.3).

Although our focus in this chapter is on the environmental aspects, social aspects are also essential for sustainable development, as we shall see in chapter 7. Here, we discuss the issues connected with production efficiency and the use of patterns that exist in nature to improve the efficiency of resource and energy use in an economy. The examples of tools used within this framework include life cycle assessment (5.T1) and eco-design (5.T2), and our case study 5.C1 demonstrates how these are used in practice.

5.2. Eco-efficiency

3P is a name of one of the best-known business programmes focused on environmental protection. It was introduced in 1975 by 3M sometimes said to be one of the most innovative companies in the world. 3P or *Pollution Prevention Pays* indicates that the purpose here is to prevent pollution before it is even emitted. Over 34 years the programme accounted for 1.2 billion dollars in savings. 6000 projects have been carried out, consisting mainly of modernising products and processes, replacing equipment used during production as well as reusing resources and recycling. The programme is based on competitions for ideas for improvement carried out among the company's employees.

3P is certainly not the only example of such an undertaking and as in other cases, the philosophy behind it is to produce more with less. It is adequate for the primary purpose of economics i.e. the most efficient use of available production factors. The more efficient production is, the smaller is its pressure on the environment, as depicted in the notion of eco-efficiency.

Here there are proximate and closely-linked ideas which refer to increases in efficiency in using the environment during production and the related financial savings (see table 5.1). In particular, these refer to examples of eco-efficiency, promoted by business, and in Asiatic green productivity.[1] Economic benefits are most clearly visible when companies are forced to internalise the external costs that they generate (see tool 1.T2) and only when they start modernisation. Constant improvements in decreasing the pressure on the environment justify referring to this approach as 'cleaner' production. The comparative of the adjective 'clean' therefore has a symbolic meaning[2] and is well illustrated by a history of similar endeavours in Poland. Even though the situation has improved significantly, further improvements in eco-efficiency are still possible within Polish companies.

Table 5.1. Concepts of more efficient use of the environment in production

Concept	**Main promoter**
Eco-efficiency	World Business Council for Sustainable Development (WBCSD)
Cleaner production	United Nations Environment Programme (UNEP)
Green productivity	Asian Productivity Organisation (APO)
Dematerialisation	Wuppertal Institute and, in Poland, Instytut na rzecz Ekorozwoju (Institute for Sustainable Development) (see Mündl et al., 1999)
Factor 4	von Weizsäcker et al. (1998)
Factor 10	Factor 10 Institute, Friedrich Schmidt-Bleek
Pollution prevention	United States Environmental Protection Agency (US EPA)

In the 1990s, especially in the first years of the economic transformation, the opportunities to increase eco-efficiency in Polish companies were particularly significant. Negligence in the previous era, as well as the widespread introduction of economic tools in environmental policy, led to a short period of capital return for the first eco-efficiency projects (even counted in weeks). Many of such projects were carried out within the framework of bigger programmes supporting cleaner production and pollution prevention, and often carried out with financial support from abroad (see for example Rouba, 1999; Doniec et al., 2002).

[1] In one of the demonstration projects of green productivity in Korea, 3 million dollars of savings were achieved thanks to 50,000 dollars of expenditure. The return was achieved in this case in 2 weeks.

[2] It is worth noticing that completely 'clean' technologies do not exist. Taking into consideration the laws of physics (in particular the first and the second laws of thermodynamics), they cannot exist. In this context, managing by-products is of significant importance and we shall look into it in the next section (see also Kronenberg and Winkler, 2009).

In Poland, eco-efficiency is promoted by among others, the Czysty Biznes (Clean Business) programme, carried out by the Polish Environmental Partnership Foundation, and in particular within its 'Waste Minimisation' project. The concept behind clean business corresponds to the principles of eco-efficiency exemplified in the following paragraph. Companies which take part in the project are subjected to inspections of their production processes and waste management practices, identifying further possible reductions in environmental pressure ('waste') and their subsequent financial losses. For Polish companies the projects that are being carried out demonstrate that the scope for eco-efficiency to be linked to further modernisation is still significant.

DeSimone and Popoff (2000, p. 45) listed the following as the basic principles of eco-efficiency:

- considering it as a process, not a one-time objective;
- basing competitive advantage on the consideration of the whole product life cycle (figure 5.1);
- a focus on selling services, rather than products (chapter 8);
- integration of sustainable development into all of the functions of an organisation; and
- cooperation, including receiving, transmitting and analysing information.

The broader definitions of eco-efficiency (DeSimone and Popoff, 2000, pp. 56–57) and its related concepts also refer to:

- reducing the material and energy intensity of goods and services;
- reducing the use of toxic substances;
- increasing the use of recycled materials and their recyclability;
- maximising sustainable use of renewable resources;
- increasing product durability; and
- increasing the intensity of using products and services.

The actions above contribute to increasing efficient use of resources, and contribute to preventing pollution. Efficient use of resources is most accentuated in the case of dematerialisation and related factor 4 and 10 concepts. The authors of these concepts have argued that a significant increase in efficiency is possible thanks to the introduction of various actions (table 5.2) and provide examples of innovative processes, products and services. Some 30 years ago, computers occupied an entire room. Today, they can be fitted into a pocket. Energy-saving bulbs are consuming a small percentage of energy used by their traditional equivalents. Almost all new home appliances use less energy and water than their predecessors. There are urinals and toilet bowls that do not use water at all or use a minimal quantity of water (see subsection 12.3.2).

Resource use efficiency is reflected in the concept of indicators that measure material intensity per service unit (MIPS).[3] Increasing MIPS can be achieved, through two strategies:

1. reducing material input needed to produce the same service unit delivered by a given product (producing a product performing the same service that uses less resources); and
2. increasing opportunities for delivering services by a given product (increasing its use efficiency), for example as a result of shared use.

[3] Service (or functional) unit is a quantitative definition of a function delivered by the product (see tool 5.T1).

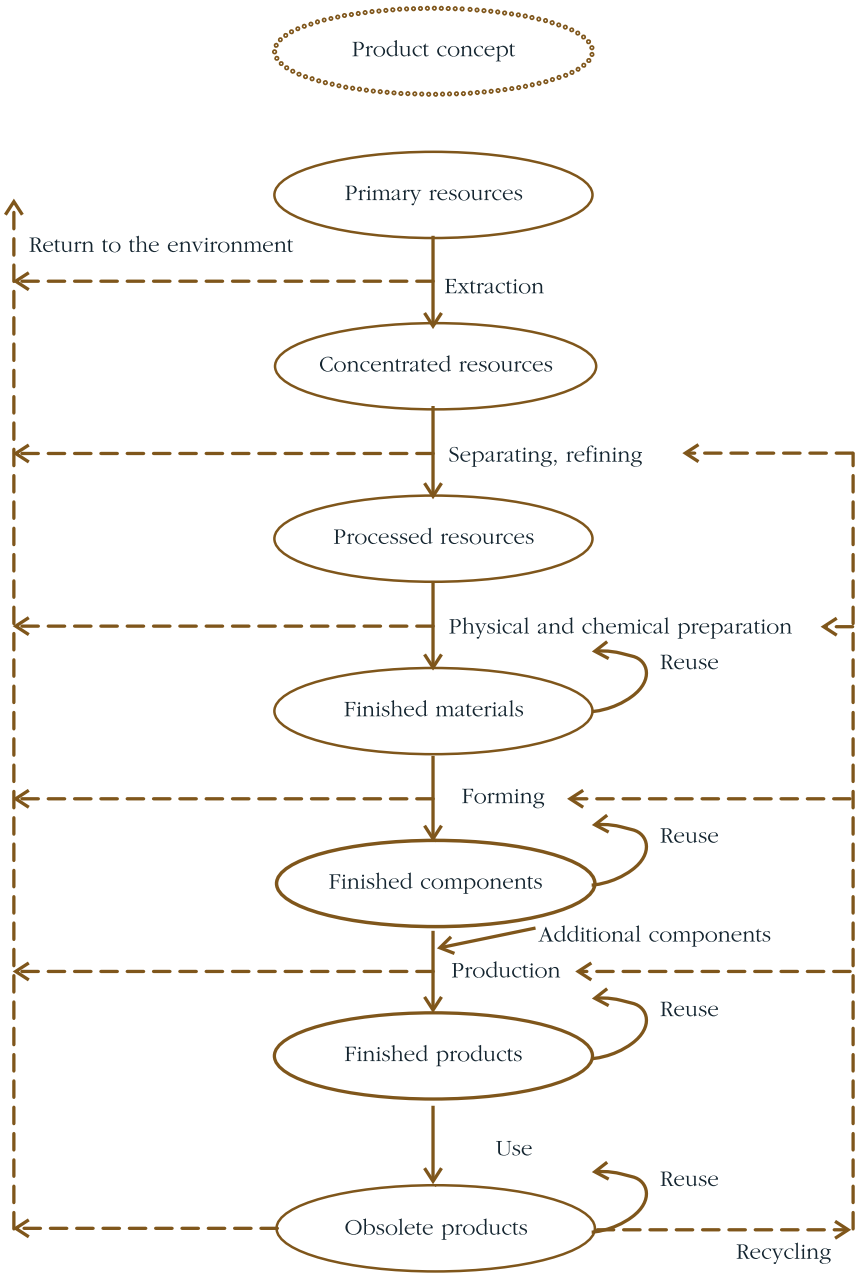


Figure 5.1. Product life cycle from the perspective of environmental management (adapted from Graedel and Allenby, 1995, p. 114)

In contrast to more complex measures, such as life cycle assessment (LCA; tool 5.T1), MIPS refers to resource consumption only. Two similar examples of eco-efficiency indicators include: cumulative energy requirements analysis (CERA), in which the sum of material input is replaced by the sum of energy input; and embodied energy used in construction industry. An alternative solution is measuring the environmental impact per product and not per functional or service unit. Material ballast (aka 'ecological rucksack') serves as an example. It requires differentiation between the direct and indirect material flows connected with the product, which we shall investigate in the following section. Simpler measures are also available, such as the ratio of primary to secondary resources used in a given product, or the ratio of recycled materials to those which could be

recycled. Yet another possibility could be a so-called carbon footprint, which depicts emissions of carbon compounds throughout the product life cycle.

Eco-efficiency can refer to single products and services, as well as to the whole activity of a company. Unfortunately, using an indicator referring to a single product, even as complex as an LCA, can overshadow a negative tendency concerning the aggregate environmental impact. The improvement of a single product's environmental performance can be thwarted by an increase in its consumption rates, as we indicated in section 3.7. This could happen if, thanks to technological development, the product becomes cheaper and more functional (for example computers). It might also happen when the consumers that were previously refraining from buying such a product or use it more economically for environmental reasons, feel freed from responsibility and can

Table 5.2. Dematerialisation strategies that can be introduced at different stages of the product life cycle (adapted from Mündl et al., 1999, pp. 48–49)

Stage of product life cycle	**Production strategy**
Resource extraction	Technological processes saving resources, minimising resource transport
Design	Eco-design, a focus on durability, reparability, reuse, recycling, limiting fashion influence, material substitution (tool 5.T2)
Production	Efficient resource use, technological development, minimising transport, recycling, closing material flow cycle, eliminating toxicity, minimising waste
Marketing	Reducing packaging, regional and local distribution
Use	Limiting consumption needs, optimising mutual use, replacing products with service, regeneration, reuse, prolonging guarantee expiry date
Waste management	Waste collection, reuse, recycling, deposit fees

indulge in their desires and contribute to the increase of the aggregate impact (see chapter 14). For example, as we already mentioned in section 3.7, although hybrid cars use less petrol than their traditional counterparts, this encourages more frequent use which translates to increased aggregate petrol consumption.

The above phenomenon, i.e. the negative aggregate environmental impact exerted by a product which is relatively more environmentally friendly than its preceding counterparts, is called a rebound effect (figure 5.2). Indeed, even though dematerialisation occurred in all developed countries, it was accompanied by an aggregate increase in resource use. Dematerialisation or eco-efficiency has to be considered at the level of a whole company and finally, the global economy. This therefore justifies adopting a systems perspective to changes introduced in companies, and cooperation across whole supply chains (chapter 7), as well as the use of innovations, such as replacing products with services (chapter 8). Industrial ecology provides a broader, systems perspective to the concept of eco-efficiency.

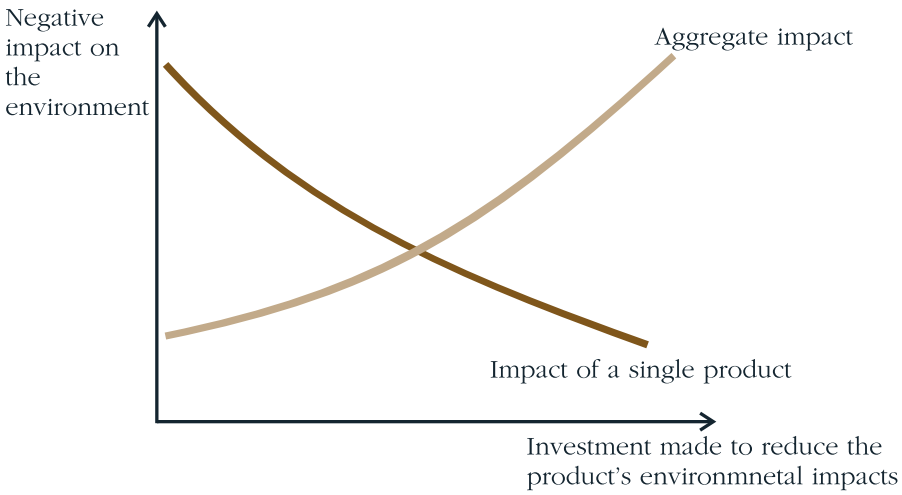


Figure 5.2. Rebound effect

Tool 5.T1. Life Cycle Assessment (LCA)

There are many different areas of application for an environmental life cycle assessment (LCA). Numerous case studies from the practice and intensive activity of international organisations, such as ISO, SETAC, UNEP and JRC prove the utility and popularity of this tool.

The quantitative character is an evident advantage of LCA. The final result of an LCA study is a number (or a set of numbers), which indicates the type and size of an environmental impact potentially occurring across the whole life cycle of products and services. The numerical result facilitates an interpretation process and allows for disclosing transparent and comprehensible information to interested parties (such as clients, contractors, suppliers, competitors, environmental protection agencies, local community and employees).

Additionally, LCA has a standardised and internationally approved methodology, included in the series of the ISO 14040 standards. Internationally, as well as for some years in Poland, handbooks have been published describing how to carry out an LCA (Guinée, 2002; Baumann and Tillman, 2004; Kowalski et al., 2007). LCA, similarly to other life cycle management tools, includes a *from cradle to grave* scope, enabling assessment of environmental impacts in a broad perspective (see also chapter 7).

There are many areas of application of LCA, for example: eco-design (tool 5.T2), eco-labelling (tool 7.T3), green public procurement (tool 7.T2), environmental management systems (section 7.2), determination of the Best Available Technique, sector analyses and green tax reform (tool 1.T2). The intended application of the LCA results impacts the goal, scope and the overall structure of the analysis, and determines its time and cost requirements. According to the ISO 14040 series of standards, a full LCA study consists of the following four phases:

- goal and scope definition;
- life cycle inventory (LCI);
- life cycle impact assessment (LCIA); and
- interpretation.

Key decisions, like the reasons for carrying out an LCA study and the mode of the LCA results application, are made

during the first phase of the LCA. Also the type and role of interested parties involved in the study (commissioner, practitioner, reviewers, competitor and consumers) should be specified during this initial phase. Other important decisions made in goal and scope definitions involve issues such as: function, functional unit, system boundaries, data quality, documentation and reviews. LCA is a function oriented analysis and it allows assessing the environmental impacts of the various options in fulfilling the same function. For this reason, only products fulfilling the same function can be analysed and compared by using LCA. In order to ensure that the function equivalency rule is met, the function should be precisely defined.

An example could be comparing paper towels with hand dryers and fabric towels. All of these fulfil the same function that is drying hands. The next question is in what proportions should these products be analysed to make the analysis comparable and fair? (I.e. how many paper towels, dryers and fabric towels are used?) In order to solve the problem, certain exploitation conditions should be assumed such as: frequency and duration of hand drying, durability of the dryer, washing conditions of the towels, etc. As the next step, and based on the above assumptions, the so called functional unit is determined, for example the drying of 10,000 hands. Subsequently, the reference flows defined as the measure of outputs from processes in a given product system required to fulfil the function expressed by the functional unit, should be calculated. In this example, the reference flows could be: 1 hand dryer, 5 fabric towels and 10,000 paper towels. LCA analysis and the environmental impacts are calculated in relation to the reference flows, in this case for the whole life cycles of: 1 hand dryer, 5 fabric towels and 10,000 paper towels. For this reason it can be said, that LCA is not performed for specific products, but for defined product systems.

Gathering data is performed in the second phase of LCA known as the life cycle inventory. The data collected is calculated and referred to as the product system (precisely, to the functional unit). Thus, LCA is a process-based analysis, always placed in more or less specified technological conditions. Detailed LCA studies require collecting a large amount of data with regards to the following issues: use of natural resources, semi-products, auxiliary materials, the levels of air, water and soil emissions, and waste. The more accurate the data, the higher the credibility will be of the final results. In order to facilitate the process of gathering data, a special kind of survey should be prepared and sent to stakeholders involved in the study (producers, suppliers, distributors, users and waste disposers). LCA databases, for example as in the Swiss *ecoinvent*, can also be used as a source of LCA data. Notably access to these databases is often for a fee, but they are available on the internet or are built-in in the LCA software packages, for example SimaPro, Umberto, and GaBi.

The third phase of LCA deals with assessing the environmental impacts and this is usually carried out by using known and well established life cycle impact assessment methods (LCIA) methods such as: CLM2001, Impact2002+, Ecoindicator99, EDIP, EPS and others. In practice, the LCIA phase is supported by LCA software, which is not limited to databases, and also includes appropriate LCIA methodologies. The final result via the third phase is the quantitative and qualitative information received on the environmental impact of the overall life cycle of the product. The level of burden is calculated in relation to different environmental problems, such as climate change, ozone layer depletion, eutrophication, acidification, mineral and

fossil fuels depletion, ecotoxicity, and presence of carcinogens.

The last phase of LCA includes a set of steps and techniques used to better understand the results received. In this case LCA software can also be helpful, as it enables its users to perform some interpretation analysis like uncertainty analysis or identification of significant issues. Here it is worth stressing that interpretation depends not only on the analysis of results, but also on determining their uncertainty.

Tool 5.T2.
Eco-design

The term 'eco-design', synonymous with 'design for environment', refers to a 'systematic consideration of design performance with respect to environmental, health, and safety objectives over the full product and process life cycle' (Fiksel, 1996, p. 3). As for traditional design, eco-design first requires planning based on a market analysis (including consumer requirements, products of competitors, environmental legal requirements, and so on), before moving onto conceptual design, detailed design, testing, market launch and product review. This is an iterative process and involves continuous improvement (see PDCA cycle; figure 4.1). The eco-design procedure should be reviewed by answering these three questions: 'Who is responsible for eco-design?', 'What is necessary to perform it?', and 'What issues have to be considered?' (Kronenberg, 2007a, pp. 144–147).

Who is responsible for eco-design?

The eco-design of products cannot be analysed separately from the eco-design of production processes. Developing new products has traditionally been the domain of people responsible for marketing in cooperation with professional designers. In the case of environmentally friendly products, these can be supported by other internal (engineers, production line and quality managers and so on) and external stakeholders (including environmental NGOs, consumers, academics and government bodies) should be involved in this process, especially during the idea generating stage. Unfortunately, with the exception of consumers, the role of external stakeholders has been relatively underappreciated. Any stakeholder cooperation of this kind should lead principally to analysing the life-cycle environmental impacts of a given product (LCA; tool 5.T1), and suggesting alternatives only on this basis. The development of new products should be supported by a thorough, scientifically based analysis.

What is necessary to perform eco-design?

Communication between all of the above stakeholders seems to be crucial for the success of eco-design. The better the knowledge management system is organised, the higher the company's 'environmental design capability' and its ability to use different eco-design strategies, that require further cooperation between internal and external stakeholders.

What issues have to be considered in eco-design?

Interdisciplinarity is important, because eco-design, apart from considering environmental issues, has to incorporate other criteria, including economic and technical feasibility, quality and so on, just as it would for traditional design. Environmental issues are central

to eco-design (Graedel, 1994, pp. 35–38; Graedel and Allenby, 1995, pp. 187–188); thus, the primary problems that an eco-design team have to deal with, regarding an entire product life-cycle, include:

- choice of materials and management;
- interactions with suppliers and other stakeholders up and downstream in the product chain (suppliers of recycled components, regulatory bodies, lobby groups on environmental standards, retailers, customers, and potential customers for recyclable manufacturing by-products, etc.);
- minimisation and specification of gaseous and aqueous emissions;
- solid waste minimisation;
- energy use; and
- recycling potential (during production and after the end of product's useful life).

Thus, eco-design involves tradeoffs between the various desired features of a product, for example environmental impacts, costs and social perception.

In reducing the environmental impacts of products, eco-design fully conforms with the precautionary principle and the principles of waste and pollution prevention. Focusing on product design and development constitutes a high leverage point, from both an environmental and economic point of view, as this stage influences about 80% of the product's environmental impacts and 70–80% of its financial cost (Oosterhuis et al., 1996, p. 229; Tischner and Charter, 2001, p. 120). Eco-design should favour improvements in production processes and aim at changing consumption and disposal patterns. Following the philosophy of industrial ecology, eco-design should stress the overall system context of the product under consideration.

Although eco-design is meant to favour a fully integrated approach to design, it has evolved from a number of more specific concepts that together form a 'design for an X' category, where X may stand for any of the desired product features (table 5.3). Eco-design (or 'design for environment') became an important aspect of 'design for X'. Although eco-design has, to some extent, reversed the logic of some of the previous trends (for example, 'design for assembly' was replaced by 'design for disassembly'), it generally complements other 'design for X' strategies, some of which are also important from the point of view of environmental management (especially compliance, reliability and serviceability).

Table 5.3. 'Design for X' and design for environment (Kronenberg, 2007a, p. 148; concepts in the left column derived from Graedel and Allenby, 1995, pp. 186–187)

Design for…		**Design for…**	
Assembly	Ease of assembly, error-free assembly, common part assembly and so on	Disassembly	Ease of disassembly
Compliance	Compliance with relevant regulations	Recycling	Ease of separation of materials
Environment (eco-design)	Environmental protection	Energy efficiency	Minimum energy consumption
Manufacturability	Ease of manufacturing: integration of a given design into factory processes such as fabrication and assembly	Durability	Life cycle extension
Material logistics and component applicability	Ease of logistics and assembly: easy movement and management of materials, relevance of components and materials	Upgradability	Ease of upgrading: modular construction
Orderability	Ease of distribution to final consumers	Repairability	Repairable and/or replaceable components
Reliability	Reliability: corrosion resistance, electrostatic discharge, operation under variable external conditions	Maintenance	Repair, upgrade, handling of maintenance residues, no toxic substances in maintenance residues altogether
Serviceability	Appropriateness for use by a service provider	Reuse	Ease of reuse
Safety and liability prevention	Compliance with safety standards, prevention of costly legal action	Environmental and health safety	Low-impact materials, reduced toxicity, cleaner production processes, cleaner energy sources
Testability	Ease of factory and field testing		

5.3. Industrial ecology

A perfect balance in nature can be interpreted from two perspectives. On the one hand, compounds introduced to nature by humanity accumulate and can return as pollution harmful to human health. On the other hand, the substances created with nature are almost completely used within it. This applies even to those substances that we would label as waste, such as dead organic matter that is transformed by organisms known as decomposers into compounds that can be used further. Similar observations have laid the basis for the concept of industrial ecology. This concept provides a framework for complex analyses of matter and energy flows between the economy and the

environment, and it suggests that general matter and energy use efficiency can be increased by copying ecosystem solutions into the economy.

Eco-efficiency shows that it is possible to significantly reduce the environmental impacts of products, services and production processes. Industrial ecology allows us to see the possibilities for increasing the efficiency of an economy functioning as whole. General observations can then be translated into suggestions for particular entities. By looking at the whole economy–environment system in time scales long enough to account for decomposition of particular compounds, we are able to draw conclusions which we can use to avoid the rebound effect. We shall now look at the principles of industrial ecology and how it is used to study and shape the relationship between the economy and the environment.

5.3.1. Principles

Industrial ecology applies 'ecological and biological analogies to socially contrived systems such as industry or governments' (Rejeski, 1997, p. 49). Its purpose is to create a sustainable industrial system using knowledge of structures and behaviour present in ecosystems. It focuses on optimising substance and energy flows, including waste prevention and using by-products as secondary resources for other processes. This can be achieved through studying and shaping energy and substance streams within an economic system according to the concept of industrial metabolism, as well as creating industrial ecosystems.

A number of industrial ecology principles were put forward, most often referring to the principles observed in ecosystems. They include among other things: the circular flow of matter, diversity, interdependence and cooperation (aka interconnectedness), locality and gradual change (see Kronenberg, 2007a, pp. 93–109). Round-put (or the circular flow of matter, as opposed to throughput that our current economic systems are based on) are the most oft-quoted relating to waste prevention and the closing of matter flow cycles.

These principles are applied to designing economic systems at different levels: national, regional or for a single company. They subsequently have been translated into more practical recommendations, for example by the Natural Step organisation. The Natural Step assumption is that human activity has to be integrated into natural flows of matter via the four famous sustainability principles. In practice this implies the necessity of reducing and finally eliminating:

- the need for natural resources;
- the use of man-made synthetic substances;
- the physical degradation of nature; and
- those activities limiting possibilities to meet basic human needs.

5.3.2. Studying

Optimising the use of energy and matter in a company or an economy requires knowledge of these flows. Based on a metaphor that compares internal processes present in economy to processes in an organism, the energy and matter flows between economy and the environment are called industrial metabolism. A survey of industrial metabolism enables us to identify the most important problems, above all the flows which are particularly harmful to the environment and to human health. It can also help to notify the decision makers about substances whose flow cycles can be closed through increase of recycling in the economic system. Finally, industrial metabolism can serve as a basis to evaluate the efficiency of the functioning of a company, its supply chains or entire industrial sectors from an environmental perspective.[4]

[4] It can be also used at the city level. In Poland, such studies were carried out for Poznań (see Macias and Mizgajski, 1998; Mizgajski, 2000).

To study industrial metabolism, we use material flow accounting (MFA). In addition to juxtaposing material inputs and outputs related to a particular system, it takes into consideration matter accumulation and indirect (hidden) flows, not reflected in the system of market transactions. The general frames for MFA are presented in figure 5.3 (see figure 1.1b) showing that the economy is part of a bigger ecosystem and depends on it as a source of resources and a processor of waste. Figure 5.3 shows that the total mass of matter in the system at the beginning of the process has to equal the total mass of matter mass which remains in the system and which leaves the system. Information gathered from material flow accounting at the level of an economy or of a particular company, can show the areas in which the efficient use of resources could be increased.

Using approximate data from the United States from the end of 1980s, each year only 6% of the total mass of resources acquired from the environment was transformed into durable products and other permanent goods (accumulation) (Ayres and Kneese, 1989, p. 93). At least 80% of mass of various ores are treated as unwanted waste (in the case of copper this is more than 99%). Figure 5.3 shows these as grey spaces corresponding to indirect flows connected with extracting the resources in any given country and worldwide. In addition, none of the fuels or elements are used in permanent products. A significant percentage of resources is transformed into packaging and other disposable products, such as batteries or light bulbs. The final result (6%) could be lower if it were not for the mineral substances other than metal, 50% of which take the form of permanent use goods (mainly cement used to produce concrete and clay used in the production of bricks and ceramics).

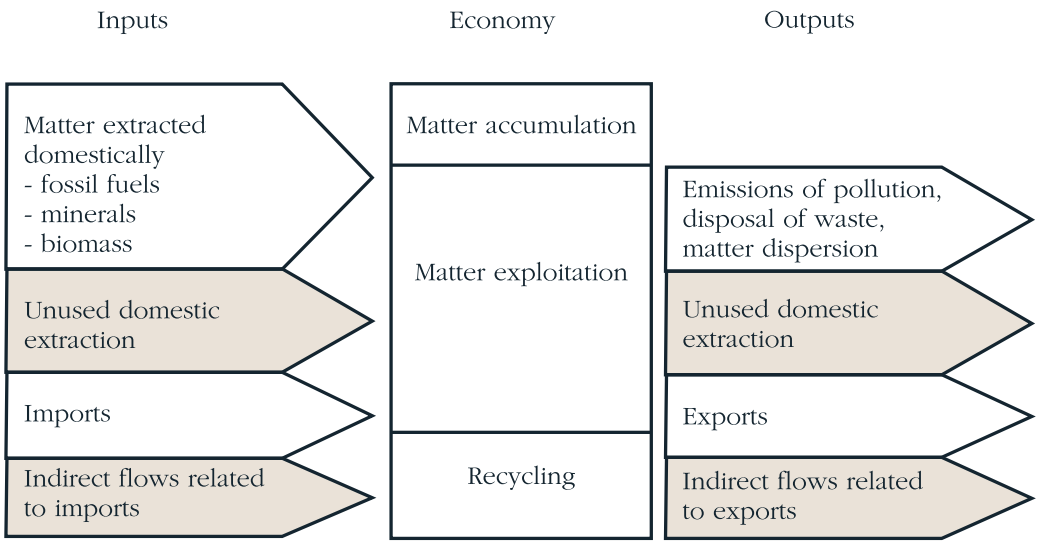


Figure 5.3. General framework for the analysis of material flows (excluding air and water flows) (EUROSTAT, 2001, p. 16)

Material ballast aka the ecological rucksack is the sum of indirect material flows connected to the whole life cycle of a given product which provides a vivid illustration of the above relationships. Direct material inputs used during the production process are reflected in the mass of the product. Indirect (or hidden) flows represent the matter extracted from the environment together with the desired resources but returned to the environment as waste immediately after their extraction. When we deduct the mass of a product from the total

mass of flows necessary for its production, we shall arrive at its material ballast. This reflects the objects that do not appear on the market and yet influence the environment. Thus, a product's indirect material inputs significantly outweigh its direct inputs.

The ballast of a product consisting of rare substances, such as gold or platinum, is particularly high. For example, the ballast of a gold ring weighting 10 g equals 3 tons, as it remains profitable to exploit resources which contain about 3 g of gold per 1 ton of extracted material (in 2009 this proportion was even lower due to the high price of gold). The ballast of a family car equals 15 tons, and not taking into consideration the water used. The catalytic converter alone, which weighs around 9 kg, has a ballast equal to 3 tons, due to its use of platinum. In each case, this ballast could be reduced by using secondary materials (Mündl et al., 1999, pp. 35–36).

Finally, industrial metabolism can concentrate on a single substance when it then takes the form of Substance Flow Analysis (SFA). Ayres and Ayres (1998, p. 2) observed that 'many of the natural cycles (for example, water, carbon/oxygen, nitrogen, sulfur) are *closed*, whereas most industrial cycles are *open*'. Therefore, industrial metabolism emphasises the basic difference between metabolism in nature and industry: efficiency of use of resources is higher in an ecosystem than in an economic system. Another significant difference is attributed to the fact that energy which drives industrial systems comes from non-renewable resources and not from solar radiation as in natural ecosystems (Ayres, 2001).

Studying industrial metabolism provides a framework for the realisation of the industrial ecology principles cited above. In particular, such studies indicate the need for research into overall product and substance life cycles, and the need for cooperation between different organisations with the aim of minimising pressure on the environment.

5.3.3. Shaping

Based on research into industrial metabolism, the shaping of economy–environment interactions can assume the following forms:

- individual actions of a single company (for example product eco-design; tool 5.T2);
- cooperative actions within a supply chain (chapter 7); and
- cooperative actions taken by companies creating an 'industrial ecosystem': simple (for example waste exchange between two companies) or complex (an eco-industrial park).

Each of these examples requires designing products and industrial processes that reduce the exchange of matter between the economy and the environment. This prevents wasting resources by giving them a form which enables further use (for example segregation and recycling) and by identifying those processes in which the functional properties of such secondary resources can most efficiently be used. It further requires customising the capacities and needs of companies that might exchange secondary instead of primary materials. Following the pollution prevention approach and the concept of industrial ecology, this contributes to making an industrial metabolism that is similar to the metabolism of natural systems (imitating the efficient use of 'waste' by decomposers in the environment). Below, we take a closer look at potential forms of cooperation between pairs and groups of companies aiming at creating simple and complex industrial ecosystems.

Waste exchanges between companies is most often motivated by the possibility of economic gain which can be achieved by reducing the costs of acquiring primary resources and the costs of waste management. As we noted in the introduction to this chapter, rates of recycling and reuse of materials had increased during the period of

economic transformation in Poland that thanks to policy and market pressures contrasted with the period of the centrally-planned economy. Examples such as using materials from building demolitions in the construction industry (see chapter 6), wood chips from lumber-mills for gardening or waste from sugar production from white beetroot for animal fodder have now become common practice.

In some cases, specialised companies are created to recycle the waste of other companies. They perform a function corresponding to that of decomposers in nature. Slag Recycling, created in 1998 to recycle waste from the T. Sendzimir Steelworks in Krakow (now Mittal Steel Poland), and acquire materials for the construction industry and road-building, provides an example of one such a company. Slag Recycling also provides an ash-slag mixture produced as a by-product of coal burning at the thermal-electric power plant of Azoty Tarnów.

If a number of companies are involved in a permanent exchange of by-products, we call such a network an eco-industrial park, a quintessence of industrial ecology. The purpose of the park is to minimise the negative environmental impacts, at the same time ensuring a stable supply of resources. By-product exchanges are established between companies located in an eco-industrial park and because all the participants benefit from the arrangement, these projects are sometimes known as 'industrial symbiosis'.[5]

The best known example of an eco-industrial park is Kalundborg in Denmark. The park is composed of seven major companies, located in the vicinity of the Asnaes coal-fired power plant: Novo Nordisk (a medicine producer), Novozymes (producing enzymes), Gyproc (a plasterboard factory), Statoil (a refinery), RGS 90 (soil regeneration) and Kara Noveren (waste recycling). Additionally, the city, farmers, and fish breeders participate in the exchange system. Current relations are based on almost 40 years of cooperation. Basic products exchanged between participants are steam and heat produced in the cogeneration process, cooling water, gypsum and organic waste. The refinery's by-product is used as a fertiliser, the amount of which equals the annual demand for fertiliser in Denmark. By-products which cannot be used in the park are sold outside (for example sulphur is sold to a factory producing sulphuric acid, and ashes to a concrete factory in Aalborg).

Economic benefits (savings), estimated at around 10–15 million dollars per year, were accompanied by environmental benefits, namely reducing pollution and demand for natural resources (especially coal, water, oil, and plaster) and demand for goods produced in the economy (such as fertilisers). All the agreements between the participants were reached without interference from outside institutions. Stringent environmental regulations in Denmark ensured that establishing by-product exchanges paid for by using waste by other companies helped to avoid the extra costs of waste treatment. Although in Kalundborg the network emerged as a result of internal negotiations, in other locations, similar projects were often supported or even initiated by local authorities or research and consulting institutions. With or without external support, establishing an eco-industrial park requires three main steps (Brings Jacobsen and Anderberg, 2004, p. 317):

1. analysis of the initial physical conditions, including the potential resource flows;
2. evaluation of economic and environmental consequences of potential exchanges for companies and for the whole region (whether or not it is economically profitable); and
3. analysis of conditions and mechanisms allowing or impeding park development.

[5] In reality, it is a special kind of symbiosis – mutualism. However, even in ecology the term 'symbiosis' is commonly used to denote situations of mutual benefit (Combes, 1999).

A range of aspects was identified which can help to create an eco-industrial park; and the above steps are intended to verify whether these factors were present in a given location. Even though different aspects mean different things, social capital is usually cited as the most important. This refers to relations between the managers, willingness to cooperate, trust, and see a common interest (see section 1.5 and chapter 15). Other essential factors include:

- by-product structure corresponding with the structure of demand for resources;
- stability of demand and supply for exchanged products; and
- geographical proximity (in the case of certain by-products).

Additionally, the creation of eco-industrial parks can be supported by: external institutions, stringent environmental regulations and lack of natural resources which mandates their more efficient use. It is worth remembering that these types of connections, which are more or less complex, often come to life while economic activities are becoming more rational, which was our starting point when we began this chapter.

5.4. Summary and conclusions

The concepts discussed in this chapter aim jointly at environmental protection and economic development that will lead to sustainable development. Some have a relatively narrow focus (for example eco-efficiency and cleaner production), focusing on picking 'low hanging fruit' by looking for those aspects that can be improved relatively easily, and in which case the outcomes far outweigh the costs.

Industrial ecology provides a broader framework for these concepts, promoting a systems approach to studying and shaping economy–environment interactions. Following a 'philosophy' of imitating nature, industrial ecology requires redesigning of processes and products. The purpose is to relieve ecosystems by providing within an economy some of the services that they normally provide (such as decomposition), which would also enhance the efficiency of energy and matter use in the economy.

All of these concepts encompass reducing the negative impacts of products on the environment. However, they often focus only on reducing relative impacts, exerted by a single product. Even if we assess the environmental impacts of a product with tools as complex as LCA, and then design it so that the impacts are limited, we run the risk that increased demand will cancel out our endeavours. At which point the aggregate impacts exerted on the environment by all similar products may increase (i.e. a rebound effect).

Unlike some of the narrower concepts, industrial ecology focuses on systems thinking and takes better account of the rebound effect. No industrial process can be considered as separate from other processes in an economy, which is especially reflected by eco-industrial parks, designed in parallel with natural food chains. Some elements of this way of thinking can be seen in the concept of sustainable construction, in particular the idea of 'construction ecology' (chapter 6). It is also reflected in sustainable chain management, as we shall see in chapter 7. Another solution supported by industrial ecology, corresponds to the principle of imitating usefulness of all the ecosystem's elements, in replacing products with services that is increasing the intensity of use of functions provided by products (chapter 8).

Suggested solutions require an innovative and unschematic approach (use of metaphors, such as industrial ecology, can be seen as helpful). They also need cooperation and developed social capital. Furthermore, they can be supported by accurate policy (forcing the internalisation of external costs), simplified regulations on waste

management, including the avoiding of overly prescriptive regulations which could impede creative forms of waste use in industry.

Last but not least, social participation in decision making is also essential in devising local development strategies, for example involving the creation of eco-industrial parks. Employee engagement in developing environmentally friendly solutions is also important because inventions that they put forward demonstrate that they identify themselves with company's policy and will contribute to reducing its pressure on the environment. Their ideas can be stimulated by employers through competitions or financial incentives (for example paying them a share of the savings made thanks to solutions they have put forward). Corporate environmental awareness programmes might also be of help in this regard. Employees who know their own work place and procedures very well, can easily identify potential efficiency improvements. Furthermore, if they contribute to improvements, they take ownership of the new standard and follow the new rules more willingly.

Practical resources

<www.epa.gov/p2/tools/p2tools.htm> pollution prevention tools and examples of good practice, developed by the United States Environmental Protection Agency.

<www.eko-spec.pl> Eco-manager, an internet-based tool supporting environmental management, principally aimed at SMEs. Based on experience of 350 companies associated in Clean Business Clubs (Kluby Czystego Biznesu) in Poland.

<www.naturalstep.org> tools supporting implementation of The Natural Step principles.

<lct.jrc.ec.europa.eu> European LCA Platform, including European LCI database for major materials, energy sources, transportation modes and waste management processes, and links to dozens of other LCA-oriented websites.

<www.pre.nl>, <www.umberto.de> and <www.gabi-software.com> free demonstration versions of SimaPro, Umberto and GaBi software, commonly used to perform LCA.

International standards on LCA:

- ISO 14040:2006 – *Environmental management – Life cycle assessment – Principles and framework*;
- ISO 14044:2006 – *Environmental management – Life cycle assessment – Requirements and guidelines*.

Questions

1. What costs and benefits do environmental protection and sustainable development entail for companies?
2. Why is material ballast particularly high for products made of rare resources?
3. What existing examples similar to eco-industrial parks do you know? How were they created?
4. How do you assess the opportunities of creating eco-industrial parks with the external support of local authorities or research institutes? What support might they offer to companies considering creating such a park?
5. In industrial ecology literature, companies are metaphorically called 'industrial organisms'. What similarities between companies and organisms justify such a metaphor?
6. Which phases does the LCA consist of and what do these include?
7. LCA refers to environmental impacts. Would it be possible to use this technique to assess other impacts of products?

Case study 5.C1.
LCA as a tool supporting eco-design

Eco-design is the most popular application of LCA, and LCA can be performed as a comparative analysis where an alternative system is introduced (for example a successor, competitive product, or Best Available Technology) or as non-comparative study where only one product system is analysed and attempts are made to improve on it. LCA can be used to analyse technologies, products, and services or only list their elements, for example, in packaging. One example of using LCA to assess a specific make of a refrigerator is described below. The study was carried out as a result of collaboration with a Polish manufacturer, with a 13% share in the market for the household appliances in Poland. The collaboration was carried out between 2005 and 2008 and was aimed at designing an eco-design procedure (Kurczewski and Lewandowska, 2008). The selected LCA results of this study are presented below.

Goal and scope definition

The assumed goal of the study was to identify the main sources of the environmental impacts generated in the overall life cycle of the refrigerators in question. The product analysed was a compression fridge freezer consisting of two compartments (figure 5.4) with an energy class that was rated as A+ (an average yearly energy consumption equal to 252 kWh). The fridge chamber's volume was 226 litres whilst the freezer chamber's volume was 92 litres. The cooling system included two independent cycles for fridge and freezer compartments where two compressors were installed. The cooling agent was R600a (aka isobutane). The fridge freezer analysed had the following dimensions: height 1850 mm, width 595 mm, depth 600 mm and weight 94.57 kg (including packaging). The product life time was assumed to be 15 years, which in normal operating conditions reflected 130,000 hours of work.

Figure 5.4. Fridge freezer under study

139 elements were identified in the manufacture of the product analysed. Those with a total weight above 1% are listed in table 5.4.

Table 5.4. LCI data regarding elements used in manufacture (adapted from Kurczewski and Lewandowska, 2008)

	Constructional elements	Mass [kg]	Material	Share [%]
1	Body	7.31	PUR	7.73
2	Fridge door cover	4.46	Steel	4.72
3	Fridge door plate	1.15	PS	1.22
4	Fridge door	1.27	PUR	1.34
5	Freezer door cover	2.84	Steel	3.00
6	Compressors fitting plates	1.56	Steel	1.65
7	Vegetables storage container	2.02	PS	2.14
8	Glass shelf	1.20	Glass	1.27
9	Balcony	0.96	PS	1.02
10	Compressor's cavity	1.90	Steel	2.01
11	Large drawer	1.29	PS	1.37
12	Small drawer	1.00	PS	1.06
13	Multibox container	2.22	PS	2.35
14	Steel sheet	2.30	Steel	2.43
15	Fridge evaporator	1.29	Aluminium	1.37
16	Compressors	13.29	Steel, copper, ABS	14.06
17	Cast drawer	1.30	ABS	1.37
18	White paint (powder)	2.39	Paint	2.53
19	White paint	2.55	Paint	2.70
20	Pigments	1.91	Pigments	2.02
21	Packaging	3.39	Wood, PS	3.59
22	Fridge chamber plate	4.96	PS	5.25
23	Body cover	12.21	Steel	12.91
24	Other materials	19.77	Others	20.90
	TOTAL	**94.57**		**100.00**

PUR – polyurethane; PS – polystyrene; ABS – acrylonitrile/butadiene/styrene

All stages of the life cycle, such as: production, distribution, exploitation, disassembly and final disposal, were included in the LCA analysis.

The fridge freezer's function was defined as keeping food fresh. The functional unit was assumed as its capability, during a minimum of 130,000 hours of work, to keep food fresh. One refrigerator unit provided the flow reference for the study.

Life cycle inventory (LCI)

Data was gathered in relation to the particular life cycle stages (production, distribution, exploitation, and final disposal) using surveys especially prepared for the purpose. It is worth mentioning that as well as manufacture data (presented in table 5.4) technical data was also used in the study. The production process was divided into the following sub-processes: sheet cutting, roll forming of the chamber covers, roll forming of the door covers, preparation of the surface and lacquering, plate production, thermoforming, centre injection moulding machining, centring of evaporators, foaming the freezer doors, preassembly, foaming of the body, and final assembly. Data regarding exploitation, disassembly and final disposal stages are presented in tables 5.5 and 5.6.

Table 5.5. LCI data regarding the exploitation stage (15 years of use)

Material	Amount	Unit
Inputs		
Fridge freezer (including packaging)	94.57	kg
Electricity	3780.00	kWh
Glass shelf (exchanged 3 times in 15 years)	3.60	kg
Containers (exchanged 3 times in 15 years)	6.06	kg
Water (cleaning)	300.00	l
Detergents (cleaning)	0.60	l
Cooler replenishment (R600a)	0.05	kg
Outputs		
Emission of cooler (R600a)	0.05	kg
Sewage	300.60	l
Wood waste (to landfill)	1.70	kg
Glass waste (to landfill)	3.60	kg
Plastic waste (landfill/recycling)	7.76	kg
Used refrigerator unit	91.18	kg

Table 5.6. LCI data regarding the final disposal stage (including disassembly and utilisation) (adapted from Kurczewski and Lewandowska, 2008)

Material		Amount	Unit
Inputs			
Used fridge freezer		91.18	kg
Nitrogen		2.88	kg
Oxygen		0.92	kg
Land use		1.51	m2yr
Water		2.75	kg
Natural gas		2.02	m3
LPG		0.0002	kg
Road transport, by lorry 16t		19.75	tkm
Electricity		14.27	kWh
Outputs			
Emissions to air			
CO		0.0004	kg
CO_2		1.48	kg
NO_2		0.002	kg
H_2O		1.21	kg
CH_4		0.06	kg
R600a (isobutane)		0.003	kg
Fractions after disassembling destined for the final utilisation			
Recycling	Steel	43.35	kg
	PS	19.90	kg
	Aluminium	3.89	kg
	Bronze	0.05	kg
	Copper	4.66	kg
Incineration	PUR	9.62	kg
	R 600a (isobutene)	0.32	kg
	Paint	6.85	kg
	Oil	0.22	kg
Landfill	Glass	6.20	kg
	ABS	3.23	kg
	Wood	0.60	kg
	Municipal waste	1.50	kg

Life cycle impact assessment (LCIA)

In order to assess the environmental impact, the ecoindicator99 method was used, making it possible to receive the final results in the form of a single number, the so called ecoindicator, expressed in points (Pt). The higher the value of the ecoindicator, the higher the environmental impact will be. A negative value ecoindicator means a profit (i.e. a positive impact) for the environment.

The first, principal issue was answering the question 'what is the main source of impact in the overall life cycle of the fridge freezer analysed?'. The results obtained are presented in figure 5.5 and table 5.7.

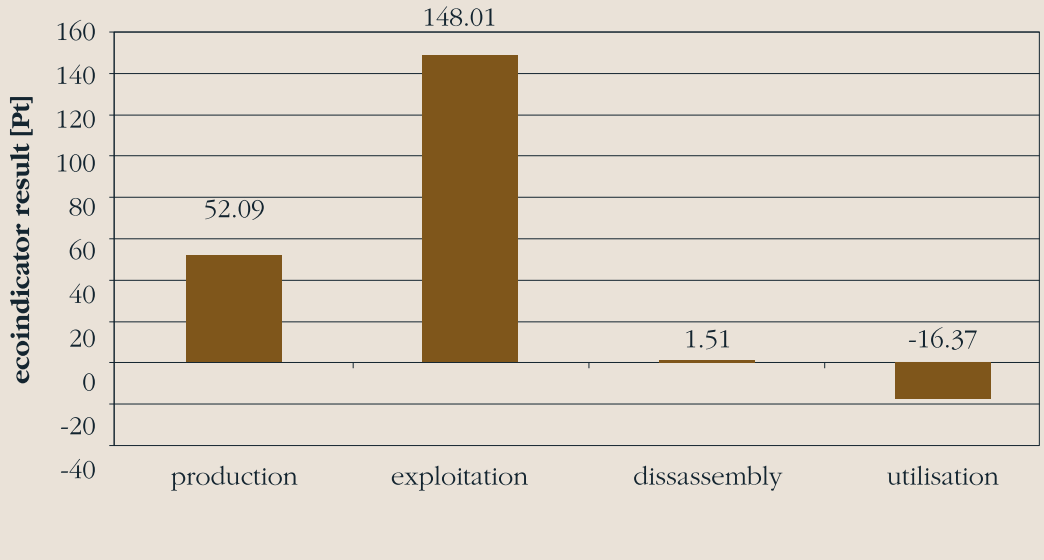


Figure 5.5. Life cycle impact assessment results for the fridge freezer analysed (based on the calculations in SimaPro software)

Table 5.7. The structure of the environmental impacts (based on the calculations in SimaPro software)

Life cycle (LC) stage		Ecoindicator result [Pt]	Share in the whole [%]	Main sources of environmental impact	Main impact categories
Production	constructional elements	49.59	26.76	– compressors – evaporator	– fossil fuels – minerals – respiratory failure caused by emissions of inorganic compounds
	technological processes	2.50	1.35	– surface preparation – centring of injection moulding machines – centring of evaporators	
Exploitation		148.01	79.90	– electricity consumption	– fossil fuels – climate change – carcinogens – respiratory failure caused by emissions of inorganic compounds
Final disposal	disassembly	1.51	0.81	– electricity consumption – transport	– climate change – carcinogens – respiratory failure caused by emissions of inorganic compounds
	utilisation	-16.37	-8.84	– ABS – PUR – paint	
Total		**185.24**	**100.00**		

The total environmental impact generated in the overall life cycle of the fridge freezer under study was 185.24 points. Almost 80% (148.01 Pt) arose from the exploitation stage, particularly from electricity input. This result was calculated for the total consumption of the electricity in 15 years was 99.67% of the total impact of by the exploitation stage. Notably the environmental impact was calculated taking into account the from cradle to gate perspective, which meant that the calculation was made from the point of the primary energy carrier's extraction, through to the production in the power plant, and the delivery to the end-user. The remaining issues, such as cleaning the fridge freezer (usage of water and detergents) or exchange of certain elements (balcony, shelves, cooler), had a low impact equal to 0.32% of the total impact generated in the exploitation stage.

The ecoindicator output for the production stage was 52.09 Pt, which constituted 28.11% of the total impact of the life cycle overall of the fridge freezer. The following elements were responsible for 71% impacts arising from production: the cooling system, the various containers, the finishing components (hole plugs, lids), the fastening components (slats, hinges, fasteners) and other components like pipes and grips (for the purposes of this analysis these are referred to as others). The comparative analyses carried out for all the mentioned groups showed that the cooling system generated the highest impact on the environment.

This LCA study was accompanied by a life cycle costing analysis (LCC), the obtained results of which are presented in table 5.8.

Table 5.8. The results of the LCA and LCC analyses (adapted from Kurczewski and Lewandowska, 2008)

	Production	**Exploitation**	**Final disposal**	**Whole life cycle**
Ecoindicator [Pt]	52.09	148.01	-14.86	185.24
Ecoindicator [%]	28.11	79.90	-8.02	100.00
Economic indicator [PLN]	644.00	1186.35	90.00	1920.35
Economic indicator [%]	33.53	61.78	4.69	100.00

A list of eco-design recommendations were made based on the results obtained. As the next step, those recommendations were transformed into eco-design tasks. Each task presented various options for realisation (variants), which are presented in table 5.9.

Table 5.9. Eco-design tasks as potential directions for the improvement for the fridge freezer analysed (Kurczewski and Lewandowska, 2008)

Eco-design task	Variant description	Number of variant
Reducing electricity consumption up to level 218 kWh/year	Replacing the current unit with a more efficient one	1
	Changing the number of units	2
	Replacing the current coolant with a more environmentally friendly one	3
	Improving the fridge freezer's isolation	4
	Replacing the traditional electrical units with magnetic ones	5
Reducing noise emission up to level 38 dB (A)	Using vibration damping elements	6
	Replacing the traditional electrical units with magnetic versions	5
	Replacing the current unit with a more efficient type	1
	Changing the number of units	2
	Improving the refrigerator's isolation	4
Reducing usage of harmful substances about 25%	Replacing the current coolant with a more environmentally friendly one	3
	Removing chlorinated paraffin used as flame retardants	7
Reducing disassembly time up to level 30 minutes	Reducing the number of inseparable fasteners about 10%	8
	Reducing the number of materials used about 5%	9
	Changing the number of units	2
Reducing the product weight	Changing the number of units	2
	Reducing the number of materials used about 5%	9
	Reducing the packaging weight	10
Achieving the recovery rate 80%	Reducing a number of the materials used about 5%	9
	Replacing the current coolant with a more environmentally friendly one	3

A comparison between the eco-design variants was done using a multidimensional comparative analysis (MCA) approach and by utilising a set of criteria (Kurczewski and Lewandowska, 2008). Based on the results obtained from MCA, three variants were selected: 2 (Changing the number of units), 3 (Replacing the current coolant with a more environmentally friendly one) and 4 (Improving the fridge freezer's isolation). Finally, LCA and LCC analyses for the chosen three variants were performed. These are presented below in table 5.10.

Table 5.10. The LCA and LCC results for the chosen eco-design variants (Kurczewski and Lewandowska, 2008)

		Production		**Exploitation**		**Final disposal**		**Whole life cycle**	
Basic variant	Ecoindicator [Pt]	52.09	–	148.01	–	-14.80	–	185.30	–
Variant 2		41.58	↓ 20.18%	128.49	↓13.19%	-13.43	↑ 9.26%	156.64	↓ 15.47%
Variant 3		51.81	↓ 0.54%	134.73	↓ 8.97%	-17.75	↓ 19.93%	168.79	↓ 8.91%
Variant 4		52.07	↓ 0.04%	136.21	↓ 7.97%	-14.80	↓ 0.00%	173.48	↓ 6.38%
Basic variant	Economic indicator [PLN]	644.00	–	1186.35	–	60.00	–	1890.35	–
Variant 2		635.00	↓ 1.40%	1002.75	↓ 15.48%	53.00	↓ 11.67%	1690.75	↓ 10.56%
Variant 3		675.00	↑ 4.81%	1112.15	↓ 6.25%	55.00	↓ 8.33%	1842.15	↓ 2.55%
Variant 4		660.00	↑ 2.48%	1078.35	↓ 9.10%	57.00	↓ 5.00%	1795.35	↓ 5.03%

Based on the results presented in table 5.10 the following specification of the particular eco-design variants can be formulated from the comparison in relation to the basic variant:

- variant 2 – comparable production cost (lower number of materials used on one hand, but the necessity of adjusting the fridge freezer to the new compressor on the other hand), lower cost of transport (lower weight of product), lower costs of exploitation (lower electricity usage) and lower costs of final disposal;
- variant 3 – higher production cost (of a new cooler), the same cost of transport (slight difference in weight of product), small changes in exploitation cost (lower usage of electricity, but higher price of cooler), lower cost of final disposal (an environmentally friendly cooler),
- variant 4 – higher cost of production (new materials and changes in production technology), comparable cost of transport, lower cost of exploitation (lower electricity consumption) and lower cost of final disposal.

The final results allow for a recommendation to select the variant 2 as the best eco-design option. From the life cycle perspective, this option can potentially give the highest reduction of the environmental impacts and the lowest economic cost.

A potential of LCA to assess different eco-design variants has been presented using the example of a fridge freezer. Thanks to LCA, as well as getting to know the total life cycle's impact, its particular stages can also be analysed. This is very important as it avoids transferring the negative impacts from one stage to another (for example the

usage of certain harmful substances as a manufactured components by a producer increases the environmental impact of disassembly and waste utilisation after use). The information obtained is transparent and easy to implement in the product's continuing improvement processes. The results received have shown that the main problems occur during the production and exploitation (usage) stages, especially during the electricity consumption from usage. Therefore, designers should treat the reduction of energy usage during the fridge freezer exploitation as a priority; other aspects did not play a significant role.

Questions

1. Based on the above example, discuss the strengths and weaknesses of LCA.
2. In the case of what other products the highest environmental impacts arises at the exploitation (usage) phase? Why?

Chapter 6.

Construction and architecture

6.1. Introduction

Sustainable building construction is the application of the rules of sustainable development to the processes of construction and maintenance of buildings throughout their life cycle. Sustainable architecture covers a broad spatial context and should guide the processes of sustainable construction, based on the ideals of firmness, functionality and delight. The aim of sustainable architecture is to ensure the lowest possible negative impact on the environment from the renovation and creation of new structures that are also accessible, safe, healthy, comfortable, and productive.

Construction is one of the most energy and resource consuming areas of human activity. Furthermore, the use of buildings can significantly create both direct and indirect impacts on the environment. Therefore a key stage in terms of mitigating these impacts is at the design stage where one should consider all the needs of future occupants of the building along with its construction costs. This includes the long-term economic, psychological, social and environmental consequences that are implicit in decisions made on design. In sections 6.2–6.4, we discuss design optimisation made regarding rational resource management with a view to safety, comfort and aesthetic satisfaction of a project.

Building construction and architecture are two closely related disciplines and a constant flow of practical knowledge between them is a necessity. A truly sustainable building can only be developed in a context that involves both of these disciplines in all the stages of design and the life of the building, These include planning, design, construction, furnishing, use of the site and building and involve the need for functional flexibility, adaptation, extension, or deconstruction potential, and overall utilisation (Kibert, 1994).

The quality and efficiency of building construction is determined by the direction of the building production process, especially the coexistence of industrial methods and craftsmanship (section 6.5). Sustainable architecture and construction have developed largely due to new and advanced technologies that enable increases in energy efficiency and comfort in buildings. In the search for optimal solutions for a given social and spatial context, it can be worth to employing the commonly overlooked, simple, and traditional techniques (case study 6.C2). The domination of advanced technology has led to impoverishment of what a building can offer, and this has limited the possibility for development that uses the traditional architecture which constitutes an important part of the cultural landscape and its widespread social recognition.

Harmonising and balancing all economic, social, and environmental activities within the vast building sector poses a challenge not only for designers and builders but also for investors and occupants. Investor awareness is substantial particularly when spatial planning proves to be inefficient. Before decisions are made on the building of a new structure, the potential of existing buildings should be assessed for their potential for renovation or adaptation (case study 6.C1), because a new building is always an intrusion in the existing environment. When construction is necessary, a key factor is location because this determines the character and the influence that a project has on local ecosystems, landscape, interpersonal relations, the vitality of its space and its surroundings, and of the efficiency of related infrastructure (addressed in chapter 10).

Investors must choose designers who have an understanding of the principles of sustainable architecture and construction. Thus, most decisions that are made by the architects determine the quality of space and indoor climate that will affect the health and well-being of the occupants, as well as maintenance costs. Architects also advise on the technology and building materials that will be used, the relationship between the building and its surroundings, and the state of the site around it that influences its wider social space and the natural environment.

Before we focus on the issues that concern the specific social and environmental responsibilities of architects (section 6.6), we must examine the common need in both construction and architecture for responsible management of energy, materials and water.

6.2. Energy

The reliance on non-renewable sources of energy has become an increasing financial burden for its users and is the cause of a major negative impact on the environment. Within the European Union, buildings are responsible for 40% of energy consumption and 36% of CO_2 emissions. Energy is the largest operational cost in construction and use of buildings (Gańczarczyk, 2010). Ensuring a healthy and comfortable micro-climate with the minimal use of energy is the basis of an energy-efficient building (see section 6.4).

The built environment in Poland is one of the most energy consuming in the EU (Loga et al., 2008). Available technologies, design solutions and materials allow for a significant reduction in energy consumption and the construction costs of energy efficient building are not significantly higher than those of a traditional structure.[1] For example, the occupants in an average house of 120 square metres could save up to 2000 zlotys per annum entirely through outer wall insulation. Investment in better insulation provides relatively fast returns, within 9 years on average (Kukla and Wojtulewicz, 2009, p. 5).

In November 2009, changes in the EU Energy Performance of Buildings Directive (EPBD) were agreed. All buildings constructed in the EU after the 31st of December 2020 are required to be energy-efficient and largely supplied with energy from renewable sources. In depth estimates suggest that by 2020, introducing the new standards in Poland could bring up to 13 billion zlotys in savings (Gańczarczyk, 2010).

The following solutions could lead to improvements in building energy efficiency.

- Building compactness (low surface area to volume ratio to minimise heat loss).
- Good thermal protection (strong insulation, elimination of thermal bridges[2]).
- Southern orientation (and, if possible, large glass surfaces on the south facing facades), energy saving glazing and window frames, buffer zones (greenhouses), collector walls (storing thermal energy).
- Protection from excessive insolation (by eaves, awnings, blinds or shutters, and deciduous trees on the south side).
- Functional interior design and zoning (depending on the hours and duration of usage). The sunny side (the south side in the northern hemisphere) should be used for functions requiring long durations of use, such as work, study, leisure. A buffer zone of technical and auxiliary rooms should be placed on the northern side.

[1] Assuming an average cost of a standard building to be 3000 zlotys/m2, the cost increase due to super-standard energy saving solutions is estimated to be between 0.3% to 4.5% (Kukla and Wojtulewicz, 2009, p. 25).

[2] The thermal bridge is a part of an outer wall where heat conduction is much greater than on the overall wall surface. Bridges are caused by a faulty built structural element, which result in increased heat losses, increased humidity and efflorescence of mould.

– Effective heat recovery. The most effective approaches are achieved through the use of intake-exhaust ventilation via a central energy recovery heat exchanger (a recuperator) which controls air circulation in the building, and provides a regular exchange of air, recuperating energy from exhausted air in order to reuse or recycle it, by warming or cooling intake air.
– Preliminary heating of intake air in a winter and cooling system in summer by a ground source heat exchanger. Heat exchangers are auxiliary to the ventilation system. They run fresh air through the ground that in Poland has a roughly stable temperature 4–10°C (figure 6.1).

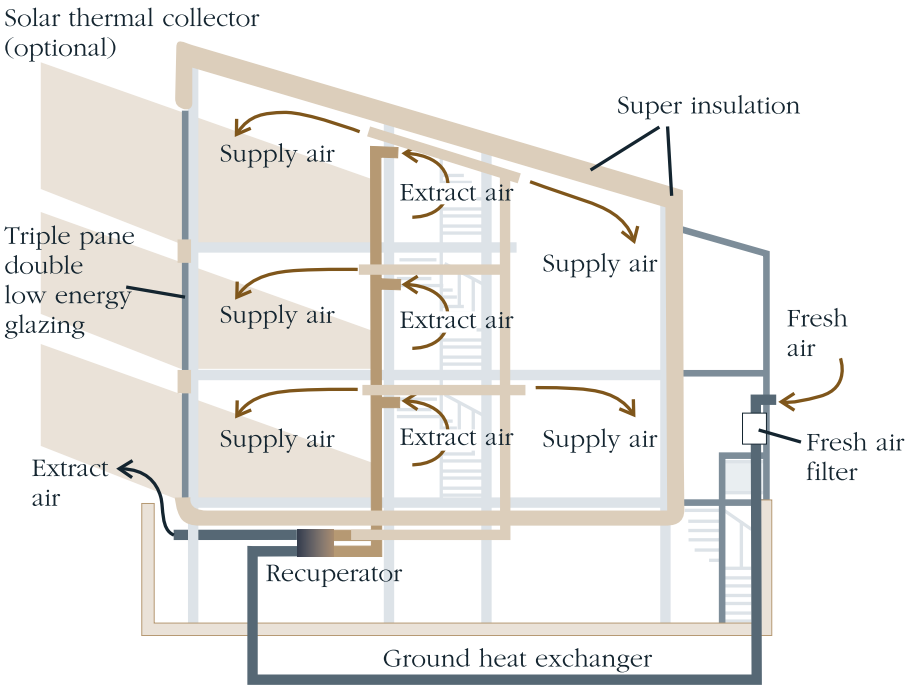


Figure 6.1. Passive systems of heating, ventilation and heat recuperation

Nearly all newly built or modernised buildings can now be constructed according to energy efficiency standards. It is easiest to implement these standards during the design and building stages, and the financial investment is offers that fastest rate of return. For improvements in energy efficiency in existing structures, thermo-modernisation (increased insulation) is used to improve the efficiency of heating systems (tool 6.T1).

Energy consumption is also a consequence of artificial lighting. Well designed windows and functional interior zoning as well as the employment of new lighting technologies help limit energy consumption. Light emission controls also limit light pollution. Internal and external lighting create a glow which distorts the natural night-life. This is a good reason for covering up bright internal lighting and limiting external illuminations. Apart from the normal exceptions, external lighting should be solely dedicated to providing security and comfort.

Tool 6.T1.
Thermo-modernisation and improvement of heating efficiency

The cheapest means of limiting energy consumption is the insulation of external walls. Insulation improvements are worth considering mostly in low-cost residential buildings constructed during the second half of the 20th century, in which case up to 70% of energy costs could be saved as a result. In some instances, correction of the outline of external walls could result in a more compact body of the building which could be beneficial. Another option is an increase in number or size of windows on the south facing side.

Specific challenges include the improvement of thermal efficiency in historical buildings. Thoughtless insulation of facades by covering them with layers of polystyrene or mineral wool may lead to the loss of the building's visual value. Decisions concerning methods to increase thermal efficiency of culturally valuable buildings should be made on the basis of a thorough analysis of various implications involved in making structural improvements.[3]

Subsequently to installing the appropriate insulation and removal of thermal bridges, it is also worth increasing the efficiency of heat sources and to optimally regulate the use of ventilation, heating and hot water supply systems. The cheapest and cleanest form of energy is solar radiation which can be converted directly into heat using water and air collectors, or into electricity using photovoltaic cells.

Solar collectors

In our climate direct solar radiation levels range from 600 to 800 W/m^2, thus solar energy has large potential. Furthermore commonly available technologies allow for the use of diffused radiation. In this way, the use of collectors in Poland could for example save up to 60% of annual water heating costs. In an energy-saving house, where the use of other heating is kept to a minimum, the preparation of hot water might constitute the largest expense of energy. Thus, the use of collectors offers a decisive step towards energy independence.

Solar panels

Photovoltaic cells may be used on a number of surfaces: roofs, walls and windows (as transparent cells). A high initial cost and low efficiency in relation to our climate result in low financial viability for solar panels, although when we consider the development of this technology it is worth supporting. In Germany, where the climatic conditions are only slightly better than in Poland, photovoltaic cells are commonly used. Their popularity has been driven by government information programmes, subsidies and preferential tariffs to introduce renewable energy into the power system.

Heat pumps

Heat pumps transform low-temperature thermal energy within the environment into usable energy for heating and passive air conditioning. Heat pumps are expensive and requiring a scrupulous, individual calculation of the costs and benefits. Heat pumps are powered by electricity which they use very efficiently, but their effect on the environment is strongly tied to the type and efficiency of power stations operating in a given locality. Thus, the fact that the Polish power industry is coal-based reduces the environmental benefits of using heat pumps in Poland (Miara, 2010).

[3] Thermo-modernisation also has to be carried out in line with environmental protection regulations, in particular with due care to the nesting sites of protected species of birds.

6.3. Raw materials and water

In addition to energy, the building industry also uses approximately 40% of the materials used in the total economy. Therefore limiting material consumption is a basic condition for sustainable building construction. Renewable and recyclable materials are highly recommended and need to be applied as soon as the design stage begins because the need for easy deconstruction and recycling of all of the building components should be anticipated. For this the preparation and securing of the appropriate technical documentation will also be necessary.

Balancing the costs and benefits arising from the use of certain materials, requires an interdisciplinary perspective and an assessment of the whole life cycle of certain products (tool 5.T1). The object of interest here should be the sources and production methods of the building materials. Energy costs resulting from production and transportation of the materials to the building site should also be taken into account. In order to reduce the economic and environmental costs of transportation, the raw materials should be obtained as close to the site as possible, although not directly at the site in order to limit the volume of waste, noise, dust etc. and to provide the best quality and working conditions.

An equally important task is the elimination of materials potentially toxic to users and producers. Materials of low natural radiation and low or nil content of volatile organic compounds (VOCs) are also preferred.

Recommended materials for the mass production of buildings include certified timber, recycled products from deconstruction or demolition, such as bricks, steel, aggregates, and local materials, such as rock, reeds, straw and clay. Among the heavy construction materials, sand-lime bricks and blocks are recommended. Glass is widely used due to its energy gain properties and the recycling possibilities. Concrete is also recyclable and has a high heat capacity, is durable and versatile, although its production uses large amounts of energy.

A substantial share of the sustainable building material market is taken up by insulation materials. The use of polystyrene foam and mineral wool decreases energy loss but due to the environmental costs of production and slow degradation, the alternatives, for example cellulose insulation (made form recycled paper), hemp mats or sheep wool more are recommended.

The choice of finishing materials should be made with regard to future maintenance needs. A good example is linoleum, which is produced from linseed oil, rosin, saw dust and jute canvas. Biodegradable materials have allowed for the abandonment of PVC for instance. Floorings made form jute, coconut thread, sisal or cork are durable and easy to care for, reducing noise and regulating humidity. Environmentally friendly floorings are made with small components which mean that only damaged or used fragments need replacing (see example of the Interface company in subsection 8.3.1).

One of the aims of sustainable building is to limit the consumption of water and to protect water quality. Sustainable buildings should limit the flow of water out of the site, provide water consumption control, the optimisation of water usage and, where possible recycling of water. Aiming for a high utilitarian and environmental value at sites and buildings, all biologically active surfaces should be maximised. The use of permeable surfaces as well as roof gardens and vertical gardens (green elevations) improves water management, climate and landscape quality, especially in urban areas. Green roofs help limit the heat island effect and for this reason some cities employ incentives for their creation (City of Los Angeles, 2006).

Installations and water appliances in buildings should:

- minimise water consumption through installation of appropriate, fully functional fittings;
- allow for collecting and usage of rainwater;
- allow for the use of grey water, for example for toilet flushing; and
- when appropriate, treat wastewater on site.

Changes in occupants' behaviour is also very important, such as the use of showers instead of baths, using water saving appliances, ensuring water tightness and technical maintenance of installations.

A relatively new, but a very prospective approach following the tenets of sustainable development, is the integration of buildings with ecosystems. This mixture may be a substitute for complicated technologies that control the functions of buildings, certain methods of material production, waste recycling, collecting and using rain water, and wastewater treatment (see section 12.3).

6.4. Indoor air and environmental quality

The basis for research into improvements of the climate in a building is driven by the issues of health preservation. The significance of phenomena like the Sick Building Syndrome (SBS), Building-Related Illness (BRI) or Multiple Chemical Sensitivity (MCS) had been highlighted by legal actions arising from serious illnesses and even deaths caused by toxicity in substances and air in buildings.

A variety of ailments resulting from long-term stays in a poor indoor climate and air quality are common especially among the occupants of modern, light, sealed and air-conditioned buildings. It is estimated that 20–30% of people working in office buildings suffer from SBS. This is caused by chemical factors, radiation, electrostatic occurrences (including air ionisation) as well as biological factors (such as fungi, moulds and microbes), vibration and noise. The World Health Organisation has listed a number of symptoms linked to staying in 'sick' buildings. Apart from the typically allergic responses, such as stomatitis, asthma, chronic laryngitis and bronchitis, many others were listed, including migraines, irritations, hypersensitivity, concentration disorder, legionellosis, humidifier fever and carcinogenic diseases caused by substances such as tobacco smoke, asbestos or radon (Zgoła, 2007).

The type of air ventilation has a great influence on indoor air quality. Statistically an average human being inhales daily approximately 15 kg of air, and Europeans and North Americans in particular spend 80–90% of their time indoors. In developed countries, malfunctioning heating, ventilation and air conditioning (HVAC) systems are the main cause of upper respiratory tract diseases. However, properly designed and well functioning installations may limit the negative influence of natural radiation of building elements or minimise the risk of allergies. Furthermore, the availability of daylight has a positive influence on health, productivity, learning ability and general well-being. The improvement of indoor climate leads to increasing efficiency in working and learning (research shows a 2–15% increase) and to improving interpersonal relations (Mendler and Odel, 2000, p. 3).

Almost all parameters of buildings may be improved by implementing appropriate control systems. Linking weather sensors and controllers with heating, ventilation and lighting systems, monitoring occupancy or, for instance, automated use of garden watering, can allow the whole system of appliances in and around the building to work at their optimum and only when required. The most advanced systems can be

personalised, so they identify occupants and individually adjust the temperature, air circulation, humidity and lighting in certain rooms. Such systems may be remotely controlled via the internet or by telephone. Installations in 'intelligent' buildings may be highly complicated and expensive however they are designed to fulfil specific needs. According to some estimates, a well-designed system can bring about the savings in energy and water between 30 and 50%.

6.5. Building construction methods

Building construction is a specific branch of production that responds to a number of basic needs and is increasingly called upon to provide the lowest possible costs in a broad economic context based not solely on the most attractive price for a given product. The quality, costs and durability of architectural structures should be discussed in long-term perspective of decades and even centuries. With regards to the 20th century, the diversity of methods and types of building construction will be the deciding factors in the overall quality and sustainability of the built environment.

Within the construction literature there are two distinct perspectives with regards to building production and development. One perspective calls for further industrialisation and development of prefabrication techniques, while another advocates the revival of traditional building crafts.

Mass production might be cheaper, more efficient and strictly controlled which allowing for more precise fulfilment of rigorous energy-saving construction. The most advanced prefabs, such as ConstrECO2 or BoKlok, ensure low cost, short building time, material efficiency, and retaining excellent insulation parameters. Such products have a very limited negative effect on the environment even including environmental costs of transport. Some producers also offer the possibility to individualise the form of modular structures to limit their potentially negative impact on the landscape.

Apart from the substantial advantages, prefabricated buildings, and mass production in general, also have some disadvantages. It is believed that due to industrialisation, buildings which used to be designed for long-term use, have become fast moving consumer goods. This inevitably leads to waste of space and materials, and has transformed cities into permanent construction sites. High efficiency and promptness of industrial construction methods have also been questioned (Krier, 2001). High quality building remains the domain of craftsmanship rather than of the industrial process. As we pointed out in the introduction to this chapter, the comparison between the efficiency of industrial methods and handcrafts requires us to consider the construction, economic, environmental and cultural details: the lifespan of a building, the possibilities for conservation and adaptation, as well as the building's influence on its surroundings. Such comparisons are at present very difficult to conduct. Worldwide, industrialisation imposed in the second half of the 20th century led to the loss of most building crafts along with their vast pool of technical knowledge.

Is the revival of traditional methods possible or needed? People possess natural predispositions to handcrafts. Practising them provides satisfaction, a sense of identity and independence. The rejection of traditional construction techniques has limited possibilities for self-development, diminishing the means of creative self-expression and the independence of a large number of people. According to Krier (2001) the educational system that defies craftsmanship is responsible for the problem of structural unemployment. Restoring autonomic crafts, increasing the choice of possible educational and professional paths may result in a rise of building production capacity, and even the revival of a traditional urban

civilisation in a modern manner. The aim is not to seek another architectural revolution, but to achieve co-existence of the various concepts of architecture, construction and varied production methods. This requires resignation from the paradigm of progressiveness via chosen architectural trends and a return to teaching of a traditional architectural and building language. In other words a return to the practical knowledge of craftsmanship that had been pushed beyond the margins of the profession to became the domain of theory or amateur self-education. The vast demand for traditional architecture cannot presently be satisfied or is at best just partly satisfied through low quality products. So what should today's architecture be like to serve the development of affordable building construction, be able to sustain, and address complex psychological, social and environmental needs?

6.6. Architectural design

In the oldest preserved architectural treatise, Vitruvius (circa 25 BC; most recent Polish edition 1999) described the complexity of this discipline and delineates synergistic connections of a number of factors to point out the three main requirements for good architecture: firmness (durability), commodity (in the sense of functionality) and delight (*firmitas*, *utilitas*, *venustas*). The connection between these three still pose a challenge for architects as an architect cannot meet one whilst ignoring the others.

Aiming for the durability of architectural undertakings, one should not solely rely on good quality materials, firm construction and efficient installations (see tool 6.T2), but also on attractiveness. Buildings that are uncomfortable, unfriendly or disfigure the landscape are often abandoned or demolished long before their physical structures degrade. On the other hand, beautiful and useful structures are likely to be renovated, reinforced, adapted and extended. Thus, their longevity is not limited by the durability of their physical structure. The architects' task therefore is to aim at longevity and delight through the creation of structures that are useful and in harmony with the social, natural and visual qualities of their surroundings. New and modernised buildings, as well as the sites on which they are built, should be biologically, functionally and visually integrated with the surrounding space. The level of integration is a significant factor determining the reduction of environmental impact, ensuring aesthetic appeal of the place, and the safety and comfort for various occupants. Hence, architects are duty bound to follow the rules of the so-called universal design which guarantee availability and comfort for all occupants, regardless of their physical ability.

At present there is no single universal concept or method to achieve an optimal integration of architecture with economic, social and natural surroundings, and as we will try to explain further, there should not be just one. In the following sections, we highlight the main ideas which, apart from their differences, all aspire to the notions of 'green', 'ecological' or 'sustainable' building.

6.6.1. Eco-tech and low-tech

A sustainable building does not need to explicitly communicate its 'green' character with the presence of plants in the interiors or on the facades, although in an intensively urbanised environment one often attempts to bring people closer to nature in this way. In developed countries, a movement known as eco-tech (Slessor, 1997) has emerged. It combines fascination with modernity and environment with an awareness of quality of life. A classic example of this is the Commerzbank Tower in Frankfurt in Germany completed in 1997 (figure 6.2). Following suggestions by the German Green Party, the architect Norman Foster incorporated environmental issues at all the design stages.

Figure 6.2. Commerzbank Tower, Frankfurt; Foster & Partners

The main element of the building's climate regulation system is the facade which is composed of two layers between which air flows unrestrained. For 2/3 of the year air conditioning is unnecessary through the use of natural heating and ventilation which reduces energy costs by half in compared to standard buildings of similar floor space. The interior contains a naturally lit spiral-shaped atrium garden passing through and connecting all floors of the building, where the gardens also take up 1/3 of each floor (Ryńska, 2004).

Green architects have conducted on an increasing number of occasions large-scale experiments. For instance, the elevations of Ken Yeang's bioclimatic skyscrapers gather solar energy while shading elements integrated with them automatically adjust light penetration, reacting actively to movements of the air and of the sun. The multi-criteria LEED assessments (see tool 6.T2) demonstrate that Yeang's bioclimatic buildings, such as the National Library building in Singapore (figure 6.3), comply with the strictest prerequisites for sustainable construction. In his recent projects (the EDITT Tower in Singapore, or the West Kowloon Vertical Park and the Waterfront Cultural Centre in Hong Kong), Yeang has interlaced the structures with greenery integrated with the surrounding gardens that together make up a continuous green system. In the not-too-distant future, gathering rain

water and hydroponic technologies are likely to facilitate food production in vertical gardens. At the same time, Yeang's principle concern remains for spatial aesthetics.

Figure 6.3. Bioclimatic skyscraper New National Library Building, Singapore; TR Hamzah & Yeang (LEED Platinum; 2007 ASEAN Energy Award)

The design process is often ever more reliant on sophisticated information technologies which allow, for example, maximal and fair use of sunlight in densely built-up urban areas and the optimisation of the flow of air, water and energy around and inside a building. One example of a design tool for this is Autodesk Ecotect which is an environmental analysis tool that allows designers to model building performance. The use of such sustainable design tools produce architectural forms that flow from the need for efficiency and productivity.

However, due to high investment costs, the complexity of design and a sophisticated production process, there has been limited demand for eco-tech. For this reason, and for its stylistic unification and isolation from the cultural context, advanced technology in architecture is often criticised. Opponents of high technology architecture claim that production and transport of its components (such as those used in Commerzbank Tower) may result in negative impacts on the environment that exceed the proposed benefits. In order to be socially useful, architecture should serve the affordability of buildings, and be based on local resources and knowledge of the basic rules of building physics (Fathy, 1976).

The emergence of this controversy means that the fascination with technology, characteristic of our time, requires balancing with broader consideration of the consequences of design decisions. Technology is not only a practical application of science but it is also a way of defining the world. Science does not only describe facts but often creates them via technology. Therefore it has to be kept in mind, especially in times when political and financial backing is given mainly to research and development of new products. Hence, it is worth reflecting how much we benefit from technology and to what extent the technology make us more dependent. Would resignation form some convenient technologies make sense?

In opposition to hi-tech architecture, low-tech or natural building (Hopkins, 2002) concepts have emerged. These concepts are based on simple solutions and widely available, cheap materials. Such an approach requires in-depth knowledge of local resources and climatic conditions. Moreover, low-tech does not mean resignation from technology because it requires a constructive, creative and scientific way of thinking. Its supporters consciously resign from the conveniences which they render unnecessary. They search for a social and even spiritual dimension in building, healing their relations with nature and other people, or just the pleasure of hand built construction, unachievable in the highly technological design and building processes.

Such an attitude is an expression of protest against dominant trends in architecture and against the way in which building needs limit the freedom of a modern person. Construction of a house or the purchase of an apartment usually consume the large part of our income and obligate us with long-term credit, even though it is theoretically possible to quickly build a house from commonly available, cheap or free materials. Moreover, this can be achieved with a few people, in a few weeks (see case study 6.C2). According to low-tech followers, the basic remedy for environmental and social problems lies in building using low processed materials, such as clay, straw, wood, rocks, sandbags and even waste, from for example cans, paper, tyres and bottles (Kołakowski, 2005).

Why then is the popularisation of such methods and techniques difficult, in spite of their obvious benefits? In accordance with the present legal and organisational norms, a number of individuals and institutions are required for the realisation of a construction project. The development of alternative methods is restrained by the existing norms and requirements concerning safety, water and energy supplies, the other utilities available, transport infrastructure, etc. It also requires specific materials, banks willing to finance non-typical constructions and companies willing to insure them.

On balance, eco-tech and low-tech can be recognised as valuable concepts which may sometimes result in successful and inspiring examples of a sustainable approach to architectural and building issues. However, none of them presents a holistic vision for sustainable development. The category that fulfils this need is the *best available*, which means defining the optimal choice of solutions in a given situation and context. Sustainable building means one of high functional and utility value, that is maintenance efficient, achieved through conscious design and construction, via an investment level appropriate to the given economic, social and cultural setting. This approach requires a highly ecological and technical culture, alongside knowledge of local conditions (Ryńska, 2004).

6.6.2. Vernacular architecture

Sustainable architecture should harmonise itself with the local environment and a cultural landscape shaped through the centuries. Vernacular buildings, being of multi-generational heritage, may inspire and identify an architectural formula or language for new construction. Thus, good architectural regionalism can be based

on wisdom regarding topography and climate that results in a harmony of architecture with its surroundings.

In many West European countries, a successful combination of regional traditions with newly functional technologies and materials can be seen. Quite often, these are not the result of individual realisations of experimental or demonstrative character but part of a mainstream. A frequent theme here is the use of elements in nature, such as rock, stones, earth, water, local wood, plants and green roofs. This architecture serves as an example of a harmonious implementation of utilitarian buildings into the environment.

A deeper grasp of the cultural heritage is the main reason for the rebirth of the earth building. Although it does not yet have a wide social acceptance because of a naturally sceptical reaction to proposed changes in norms or habits. However, the ground-insulated building is low-cost and has a minimal impact on the environment (Górecka, 2004). This therefore offers an alternative to the conventional building and an opportunity for investors interested in high capacities which, after submerging the building in the ground, can be better harmonised with the landscape (figure 6.4).

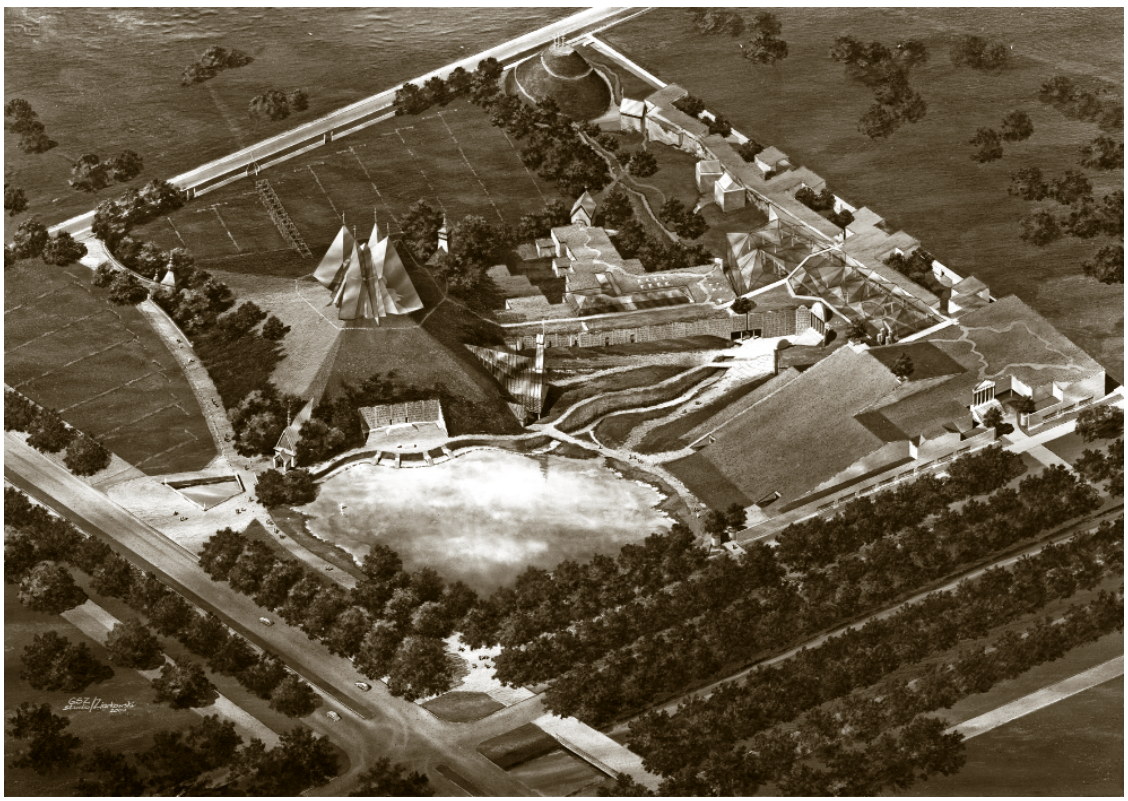


Figure 6.4. Conceptual project of the Sanctuary of God's Providence in Warsaw, by M. Budzyński (1st prize in 2000 competition)

6.6.3. Ethical dimensions of architecture

Architecture is a profession of public trust. Its rules are established in a code of ethics which has not much changed since the time of Vitruvius: design should be in accordance with the needs of the occupant; sufficiency is recommended in terms of the economy and the available technologies. Buildings should be beautiful, but the architect should themselves be modest. One of the most important ethical guidelines concerns the sensitivity for social character of place and the need to respect the context of the landscape.

Professional codes of ethics that function in Poland and other European countries today list a number of obligations that include: to sustain and develop knowledge, respect existing values and natural and cultural heritage, and to care for their preservation and development. Architects are required to aim for 'improving the quality of life and dwellings as well as for the quality of the environment and surroundings in a way that does not compromise their equilibrium' (Chamber of Architects, 2005). These obligations are generally in line with the principles of sustainable development and oppose the frequent intuitive search for new architectural forms at any cost. Responsible architecture requires a return to the classical rules of propriety, responsibility in accordance with form and content, reliable craftsmanship, the development of a scientific basis for the field and the use of ethical criteria. Architects are also responsible for ensuring the appropriate qualifications of the people working under their direction and the proper supervision of their work.

Tool 6.T2.
Building certification

Green building certification is a form of eco-labelling (see tool 7.T3). Its aim is to provide concise information on the scale of a building's impact on the environment i.e.: through energy efficiency, use of resources, controlled emissions, volume and type of waste generated, and building integration with its surroundings. Certificates are issued for structures that fulfil such specified criteria. Usually, the standard of a building is set at the design stage from which appropriate functional and technical solutions are selected.

Energy performance certificates

Since 2009, all new buildings in Poland or their parts accepted for use, sale or rent to new tenants, require a certificate of energy performance. The certificate describes the average levels of non-renewable primary energy (PE) and final energy (FE) for every square metre of floor space per year. Unfortunately, the PE level was set at a relatively low level in comparison with other EU countries of a similar climate, and even lower than justified by their economic viability. Furthermore the application of energy classes had been relinquished even though this might have made the system clearer to end-users. However, these certificates include practical information on the thermal insulation of a building, its heating appliances and the demand for energy divided into aims and means. On this a basis, an estimate of annual energy cost can be individually prepared.

According to the EPBD directive, the prevalence of energy performance certificates should increase by 2020. They should be applied to every building in the country and preceded with a reliable audit of heating, ventilation and air conditioning systems.

Passive House certification

Passive House certificates are among the most popular in Europe. They are issued by Passivhaus Institut in Darmstadt and apply to architectural designs, technologies, companies, products and most of all complete and fully equipped buildings, verified for compliance with the Passive House standard. Such buildings provide comfortable temperatures without the need for a separate heating or cooling system. All heating needs are realised through the gathering of solar energy and heat recuperation. In meeting these aims, a passive building is limited to a maximum of 15 kWh per square metre per year. However, limiting energy consumption for heating is not sufficient alone for the certificate. An important factor is the total

demand for primary energy necessary for heating and cooling the building, water heating and household appliances. In a moderate climate, the total energy demand for a passive building cannot exceed 120 kWh per square metre per year, which is eight to ten times less than a standard building. The use of energy-saving household appliances that were mentioned in the previous chapter assume special significance in this case.

Passive building construction has developed mainly in Germany, Austria, Switzerland, France and in Scandinavian countries, where it has been supported by subsidies and allowances. Through the framework of CEPHEUS programme (Cost Efficient Passive Houses as European Standards) many demonstration projects beneficial to the development of energy-saving building construction have been carried out.

Multi-criteria assessment for sustainable building

Increasingly, builders optimise construction projects that take comprehensively into account the long-term perspective of building maintenance, mortgages, the long-term impact on health, human well-being, working efficiency, building capacity for adaptation to various purposes, and the possibilities for its utilisation. Sustainable buildings have a higher market value, but in determining value some objective and recognised multi-criteria assessment tools must be used. Complete assessment systems provide a concise framework for design, construction, operations and maintenance solutions, throughout the life cycle of the building. The rating systems used address the location and site, water efficiency, use of energy and the impact on the atmosphere, building materials used, resource management, the quality of the indoor environment, the use of innovation, its social value and the quality of its climate.

The oldest system of multi-criteria certification is the British BREEAM which at present enjoys international status. Lately introduced certificates include: Green Star (Australia), Green Mark (Singapore), DGNB (Germany), MINERGIE (Switzerland) and the most popular, LEED (Leadership in Energy and Environmental Design) created by the US Green Building Council and adapted with certain amendments in a number of countries worldwide. Specific systems in LEED certification were created for various groups of structures, such as new constructions, major renovations, retail buildings, commercial interiors, homes and neighbourhoods (see tool 10.T4).

The Polish Green Building Council (PGBC) promotes the implementation of multi-criteria building certification systems in Poland. On the 23rd of February 2010, the PGBC signed an agreement with the BRE, concerning the adaptation and implementation of the BREEAM system in Poland. The success of this venture will rely on popular knowledge of the certification and the reasons for it. Although certification is expensive (which depending on the certificate, the expected level of certification, project volume and duration, may cost 50–300 thousand euro), it is profitable in a well developed real estate market. At this scale of operation, the certification process applies mainly to large projects.

6.7. Summary and conclusions

The aim of sustainable construction is managing building life cycles, healthy conditions for occupancy, and the minimisation of holistic costs of construction and maintenance. The designer is therefore obliged to cooperate well with a variety of specialists, use scientific approaches, and exploit potential in the local environment with its available technologies and social resources.

Architecture that complies with the rules of sustainable construction implies working in the context of a specific location that reflects its climate, landscape and tradition. The difference between the domains of architecture and building construction are the obligation of architects to aesthetically shape the space and take the broad social context into account.

Architectural design is the field of shaping the material world, and thus it is an act of power which always brings with it a responsibility. The basic knowledge of what is considered by a society as socially significant comes from tradition which in the field of architecture is based on typological, morphological and landscape relationships. Creativity in modern architecture is too often an aim in itself or bait to increase the demand for real estate as another consumer product. Therefore inventions, discoveries and innovations should be treated as means of reaching the goal of a durable, safe, useful, comfortable, and beautiful, or at least interesting space. Respect for environmental values does not limit the creativity of an architect because on the contrary, it constitutes a stimulating challenge that allows architects to reach a higher artistic level.

Practical resources

Websites for the organisations mentioned below feature case studies and tools in support of sustainable building construction.

<www.bre.co.uk> Building Research Establishment (BRE) from the United Kingdom is the initiator of BREEAM, the first widely recognised tool for a multi-criteria building sustainability assessment.

<www.cibworld.nl> International Council for Research and Innovation in Building and Construction is an international research organisation that throughout the last decade was a leader in promoting the principles of sustainable building construction.

<www.iiSBE.org> International Initiative for Sustainable Built Environment (iiSBE) is an international non-profit organisation with the general aim being the active promotion and fostering of policies, methods and tools for the sustainable development in the built environment on a global scale.

<www.usgbc.org> US Green Building Council is the first green building organisation in USA, propagating the LEED (Leadership in Energy & Environmental Design), an internationally recognised certification system.

<www.plgbc.org> Polish Green Building Council, accredited by World Green Building Council, that aims at promoting sustainable design, construction and use of buildings in Poland.

<www.wbdg.org> The Whole Building Design Guide (WBDG) is a guidebook on the principles of integrated design and a system approach to building construction.

<www.ehah.org> Earth Hands and Houses website dedicated to low-tech building construction.

Questions

1. How can the energy efficiency of buildings be increased?
2. Is sustainable building more expensive than standard construction? How can the costs of construction be reduced?
3. How can illnesses caused by living and working inside a building be limited?
4. Does sustainable engineering benefit more from craftsmanship or industrial methods?
5. What is the difference between eco-tech and low-tech concepts?
6. Can traditional architecture serve sustainable development?

Case study 6.C1.
Sustainable renovation of the Turzyn Neighbourhood in Szczecin

Ecological architecture should not only focus on new objects, futuristically designed buildings or avant-garde 'green' architecture, because they constitute little of the existing built environment. Most contemporary houses will still exist in the future and continue to have an impact on the environment, therefore the 'green architecture of the future' hides the potential in today's urban structures. The example below of the sustainable renovation of the Turzyn Neighbourhood in Szczecin was a pioneering approach in Poland. This project demonstrated the potential of similar activities in the renovation of old apartments in Poland and a sensible management of the resources provided by the 'urban material storehouse'.

Previously a common way of renovating old housing, known as a 'general overhaul', was followed in selected buildings and involved the practice of using heavy, material-consuming construction technologies. Often, this led to excessive interference with building structures and many elements which were still useful or could have been repaired were destroyed and thrown away, such as wooden ceiling beams, staircases, and the majority of doors and windows. Isolated general overhauls were comparatively more expensive than renovations carried in bigger housing areas. Whilst at the same time, overhauls almost never included adjacent yards and streets, due to limited budgets and lack of financial incentives. The alternative, comprehensive renovation at a neighbourhood scale was more recognisable for the city than the renewal of single buildings. Furthermore, lack of renovations of multi-family houses meant that many buildings were in poor structural condition. Thus, a new strategy to renovate pre-war buildings was necessary as it was also in post-war structures to sensibly exploit the materials used in their construction.

Some complex renovations in large urban areas were established in a few Polish cities, for example, in Lublin in the 1990s, on the initiative of city authorities. Here three strategies of renovation of buildings were established, which to varying degrees involved private owners through public-private partnerships. Another example was the Housing Development Strategy, established in the municipality of Bielsko-Biała, with which part of money raised through the emission of municipal bonds was allocated to a renovation program. Within the framework of this program, municipal real estate agencies were restructured to among other things ensure the better management of existing housing resources.

With regards to comprehensive renovation of big urban areas, one interesting project was that initiated in Szczecin in 1991. A municipal renovation task force was established and developed a Renovation Strategy for the Szczecin Inner City Area. The strategy defined the order and rules for a complex renovation of central neighbourhoods, identifying two types of financing: the 'commercial model', in which attractively situated neighbourhoods were to be renewed by private investors; and the 'budget model' that was financed from the city budget and public funds (figure 6.5).

Five neighbourhoods situated in the commercial part of the city centre were renovated via the commercial rules, and carried out by Szczecin Renovation Society, with financial support from American funds. Elsewhere, near to Tkacka Street, the renovation was funded via the bonds with the introduction of new complementary buildings, with the local building and property development companies established as the main investors.

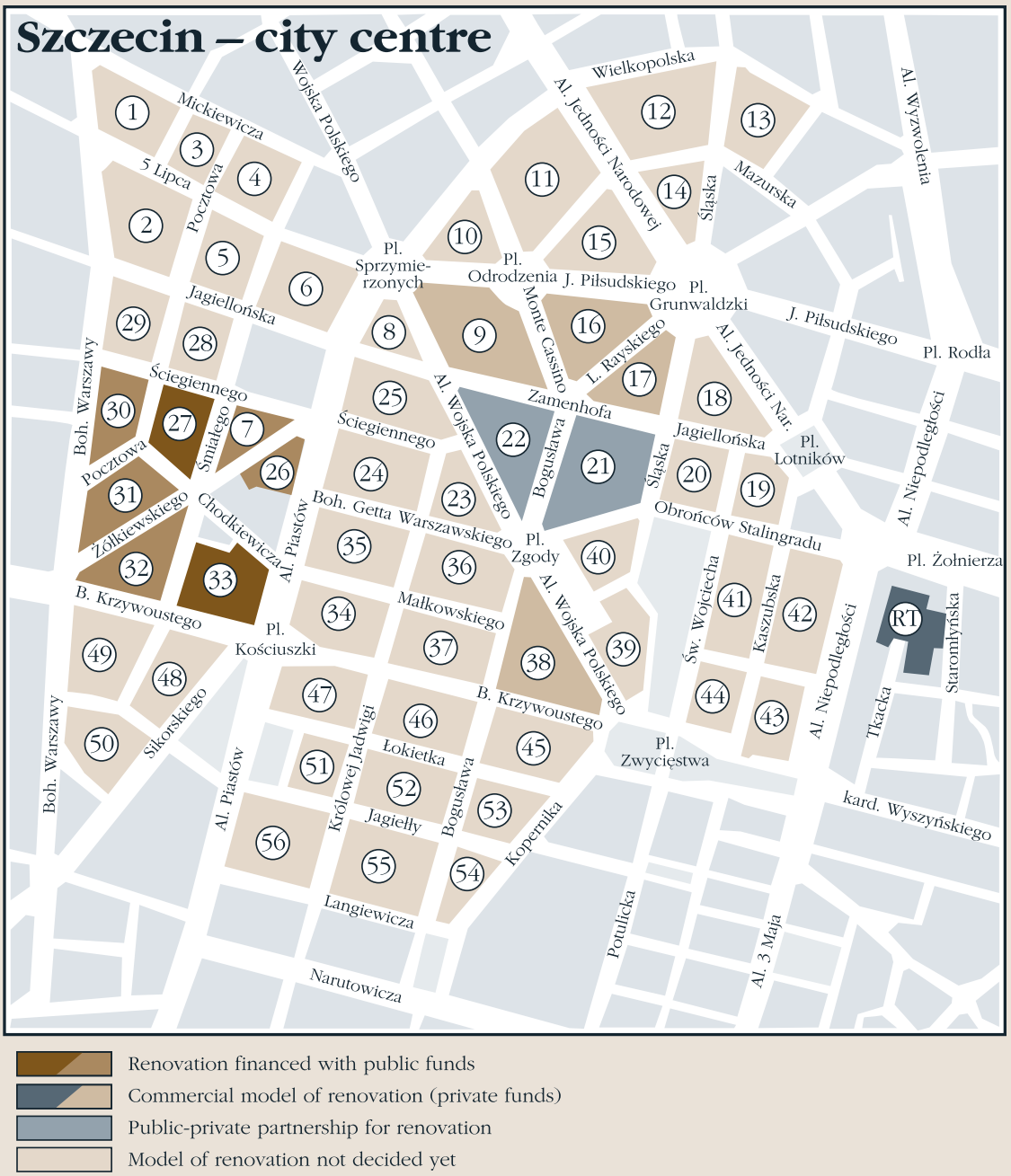


Figure 6.5. Map of Szczecin city centre with 56 residential neighbourhoods intended for renovation within the framework of the Strategy (1992)

The Renovation Strategy covered 56 neighbourhoods. Because of problems with acquiring funds for quick and simultaneous renovation of a bigger number of the neighbourhoods, in 1994 the 'Little Improvement Programme' was established, to provide financial support from the city budget for small investments, initiated by tenants. The programme's aim was to improve living standards by refitting apartments with lavatories and bathrooms, the elimination of coal-fired boilers and installation of new heating systems. In 1998, alongside the complex renovation of certain neighbourhoods, a new programme known as 'Our Home' was initiated to support housing communities with municipal donations to renovate communal areas of buildings (for example renewing

and insulating front elevations, renovating roofs and staircases, and rearranging back-yards). Both programmes were positively perceived by the tenants, and their realisation improved the structural condition of buildings. They led to a spectacular decrease of air pollution from coal-fired boilers and increased the interest of tenants in the spaces in which they lived. Since 1998, acting on behalf of the city government, part of the central neighbourhood has been administrated by the Szczecin Society of Public Construction (STBS), which has smoothed the process of management, investment and rotation between apartments (moving in to new flats built by STBS and leaving old ones via exchanges).

Sustainable renovation levels

Between 1994 and 1999, one of the Turzyn neighbourhoods where the 'budget model' was followed – neighbourhood no. 27 (hereafter the Turzyn Neighbourhood) – had became the site for the Demonstration Project in Sustainable Renovation. The project was carried out by a Dutch consulting company, Woon Energie, in cooperation with the municipal renovation task force, faculty members from Szczecin University of Technology and designers from Studio A4, who won a competition for a development plan for the whole neighbourhood. The project was sponsored by the Dutch Ministry for Spatial Planning, Housing and the Environment.

The following three main rules were defined as the most important for the renovation process:

1. use of environmentally friendly building materials;
2. saving water; and
3. saving energy.

For practical, theoretical and financial reasons, the renovation of the neighbourhood, comprising about 350 apartments, was carried out at three different levels (figures 6.6 and 6.7):

- level A – in 100 apartments – solutions applicable on the widest scale, that could be recommended in every average renovation;
- level B – in 20 apartments – referred to as 'above the standard'; and
- level C – in 4 apartments – referred to as 'experimental'.

For the three levels alternative material solutions were established, on the basis of life cycle assessment (LCA; tool 5.T1) and an environmental preference method. Based on previous assumptions, the materials were intended to fulfil the following criteria (Anink and Boonstra, 1996):

- a long life cycle;
- local accessibility; and
- preference for leaving or using materials in renovation.

With reference to environmentally friendly building materials, certain preliminary assumptions were verified in practice and relaxed. The same happened regarding waste management, in which case initial ambitious assumptions had to be relaxed (table 6.1).

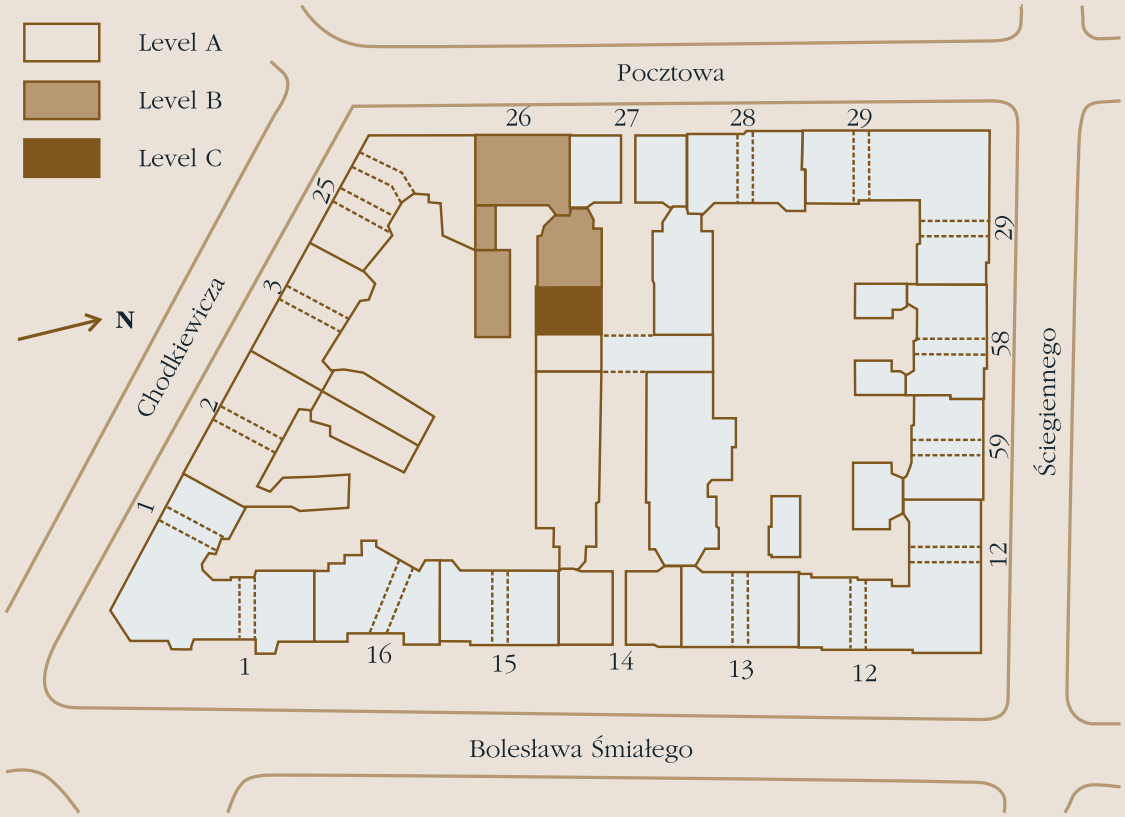


Figure 6.6. Three levels of renovation in the Turzyn Neighbourhood

Table 6.1. Differences between the assumptions and the reality of waste treatment in the Turzyn Neighbourhood renovation project

Assumptions		**Reality**
Segregation of:	– ceramic rubble and mortar waste – chemical waste – paper and paperboard – wood, metal and glass	– separation of ceramic rubble only – mixture of other waste sent to landfill

Segregation of building waste makes most sense within a radius of about 50 kilometres when there is a waste processing site nearby. Otherwise, there should at least be an organised flow of information regarding supply and demand for innocuous waste, such as earth from excavations or ceramic rubble that could otherwise be used for levelling land. As these solutions were lacking in Szczecin in the 1990s, and there was no law that could enforce proper waste management, most waste was sent to landfill. This included hammered concrete ceilings, reed ceilings, pulp, old doors and windows, packaging, cans, paint containers and other chemical based building products. Although at least in the course of the renovation works, bricks were reused. In addition, 80% of the old wooden floors were left in place as a base for new floors

made of wood or marmoleum.[4] Most of wooden staircases were kept and wooden ceiling fittings were repaired and strengthened.

The Level C renovation scheme foresaw the repairing of old windows, doors and floors. However, in most cases the condition of these was so bad that they had to be replaced. As replacements, wooden components were used in spite of pressure from the tenants to substitute them for plastic ones.

The proposed materials for thermal and acoustic insulation were not built in, either. Rock wool (clinker-basaltic) and foamed polystyrene were used instead of glass wool (recycled glass) and cellulose granulate (recycled waste paper). This resulted from the accessibility of these materials, the predominance of these technologies and their related economic factors. In total, only about 30% of the planned 160 environmentally friendly materials were actually used.

Apart from problems with financing of the overall investment and sometimes problems with accessibility of materials, the major barrier was the resistance of building companies in using materials and technologies that they had not used before. Subsequently, the main factors for selecting any given material were unit price and accessibility. It has to be recognised that sustainable renovation is relatively laborious and requires a great deal of construction supervision and cooperation between contractors, designers and building consultants. Such a project could further be supported by professional training for designers and contractors. Initially, lack of adequate supervision and the tendering of the cheapest contractors in the first part of Szczecin renovation led to many failures.

In Szczecin, communication between participants regarding the renovation process in the use of environmentally friendly building materials was unsuccessful. Additionally, there was a problem with a lack of environmental awareness amongst tenants which was not resolved in by a relevant educational campaign. In fact, there were failed attempts to change the tenants' approach, such as a campaign promoting the waxing instead of varnishing wooden floors. To inform tenants of the innovations used in apartments and the goals of the sustainable renovation, leaflets, newsletters, instructions and meetings were arranged. Financial aspects were highlighted as the most convincing in changing people's attitudes, rather than the environmental benefits.

The experience gained in the Turzyn Neighbourhood suggests that it is important to inform tenants regarding the proper ways of using all appliances and installations in the renovated apartments, both when they move in and after a period of occupancy. In Neighbourhood no. 27, the meetings were organised only when the tenants moved in. However, lack of subsequent meetings, after the tenants' confronted their appliances and building materials, led to incorrect use and waste. For example, mechanical ventilators were turned off, because of the tenants' fear of high electricity bills. Meanwhile, because of the small number of chimneys that were not adequate for gravitational ventilation, mechanical ventilation was installed in renovated buildings, which should have worked continuously. However, when some tenants turned the ventilators off, the lack of ventilation led to damp and the growth of mould. Subsequently, in buildings that were renovated later it was made impossible to turn the ventilation off.

Sociological research, carried out among people living in renovated buildings, has shown that the solutions applied were well received. Although the tenants did not know

[4] Marmoleum is a 100% natural floor finishing, made from linseed oil, resin, saw-dust, natural dyes and jute, and is 100% biodegradable.

Figure 6.7. The Turzyn Neighbourhood, a bird's eye view

much about their environmental performance, being conscious of living in environmentally friendly building was perceived as an additional benefit. Almost everyone admitted that measuring devices (warm and cold water and electricity meters) installed in their apartments provided the best motivation to save energy. However, the city was not prepared for rational waste management and there was a lack of financial mechanisms to encourage people to separate and recycle building waste. Had a system of economic incentives been in place, this might have changed the attitude of building companies towards waste management and the use environmentally friendly building materials.

Renovation and revitalisation of big urban complexes of buildings offers great potential to reduce the negative environmental impacts of cities. Thus, establishing the relevant environmental standards and mechanisms to ensure good workmanship and financing are important if sustainable development is to be achieved. Increasing quality of life in this way concerns not only historic housing, such as old and pre-war buildings. It also concerns a significant proportion of post-war buildings, especially apartment blocks made with prefabricated slabs that require attention in this respect. In line with the idea of prevention, spreading renovation programmes to different kinds of building resources can ensure that their potential for sustainability is not wasted.

Questions

1. Why is renovating existing buildings more environmentally friendly than demolishing old structures and building new ones?
2. Why is public participation important in a sustainable renovation process?

Case study 6.C2.
The straw bale house in Przełomka

When the potential for using existing urban and building structures has been fully exploited, new buildings should be constructed in a way that minimises their environmental impacts. As an example of how to reduce the environmental impacts of a building, we now look at the low-tech idea, with an example of a small cottage type house, designed and realised by the architect Paulina Wojciechowska in Przełomka near Czarna Hańcza, close to the Suwałki Landscape Park (figure 6.8).

The house represents the concept of 'ecological earth architecture'. Its construction started in the summer of 2000, and as the first straw bale house in Poland, covered with clay plaster. It was inspired by traditional cottages and was constructed using only natural and local materials, that in the majority of cases were also biodegradable. Most of the house was handmade, without using any heavy building equipment. The local community took part in this project, because many activities could be performed by people who did not have any formal qualifications and only needed the supervision of an experienced craftsman or site manager. Paulina Wojciechowska, who lives in Great Britain, is experienced in building using natural materials, mostly from earth and clay. She travelled extensively, cooperating with among others Iranian architect Nader Khalili at the California Institute of Earth Art and Architecture and Bill and Athena Steen of the Canelo Project Foundation.

Figure 6.8. Straw bale house in Przełomka

Building from earth and clay has a long tradition in Poland. One example is the palace in Tarchomin dating from the 19th century, and built from tamped clay. Still today, in many parts of the country, many houses and farm buildings are made of natural materials, using different earth building techniques. They include constructions made of dried clay bricks or wooden lattice in which the spaces between the beams are filled with clay pulp mixed

with natural fibres. Those constructions are often hidden under many layers of cement-lime plaster and paint. Many of them however are now ruins due to lack of renovation, as well as lack of cultural identification by immigrants with the old craftsmanship (for example this was the case with the old German buildings in the western part of Poland). Geological surveys have shown that clay is abundant in Poland, occurs in different fractions, and can be widely used as a cheap and easily available building material.

Nevertheless, wide use of traditional building methods (i.e. using earth and clay) faces resistance by society. Houses from clay are associated with poverty and a low standard of living, they are associated with poor shanties rather than modern architecture. Also, in modern times, it is easier and more convenient to build from concrete blocks and cement roof tiles available from a nearby shop, rather than laboriously extracted and transformed from natural materials from the environment by individuals. Comparing the environmental impacts exerted by prefabricated building material and natural local products, we see there is a large potential for traditional building solutions (table 6.2).

Table 6.2. Comparison of profiles of 'ecological' straw bale houses against a regular single-family house

'Ecological' single-family house (based on the examples in Przełomka and Płońsk)	**Standard non-ecological single-family house**
Foundation Local fieldstone or few layers of bags filled with earth, placed in a trench and covered with fieldstones and boulders	**Foundation** Reinforced concrete walls and bases, insulated against damp with bitumen, and polystyrene foam as thermal insulation
External load-bearing walls Straw bale sheaf (about 45 x 45 x 80), in this case not seasoned, but plastered with three layers of clay plaster mixed with straw chaff	**External load-bearing walls** From hollow concrete blocks or slag concrete blocks, covered with cement-lime plaster, insulated with polystyrene foam boards, covered with acrylic plaster
Flooring on earth Local fieldstone or flooring from multi-layer clay pulp, covered with oil and waxed	**Flooring on earth** Concrete, finished with PVC
Roof construction From local wood	**Roof construction** From wood, steel or reinforced concrete, and monolith
Roofing Straw thatch with extra layers of thermal insulation, made from granulated cellulose (eco-fibre)	**Roofing** Bituminous roofing felt or cement roof tiles, insulated by rock wool

The house in Przełomka was built as low impact house (a minimum impact on the environment in relation to building materials and technology, including a low carbon footprint). Most of its elements will not be the cause of waste when the house is rebuilt or demolished, because the materials are natural, recyclable and biodegradable. The building has a relatively low level of grey energy,[5] because most

[5] Grey energy is hidden energy, consumed during the whole life cycle of the building: in construction (including transportation and production of building materials), exploitation, future demolition and waste management.

of it was handmade and the use of local building materials limited the energy needed for transportation.

Architecture based on the use of local and natural materials is also called healthy building as it ensures a beneficial internal microclimate and unique climate in rooms. In many developed countries, healthy buildings have become increasingly popular, increasing the use of natural building materials. Simple buildings, similar to the one created in Przełomka, that combine simplicity and modernity, are being built in Austria, Germany and France. Soon, low-tech architecture may also see a revival in Poland, invoking traditional solutions and combining them modern requirements.

As part of 'urban civilisation' most of us feel isolated from the environment and neglect to act on our environmental impacts (see chapter 10). We spend most of our lives in closed spaces, filled with chemicals and radiation from technical appliances, often exposed to the sick building syndrome (SBS, see section 6.4). Using natural and local building materials, as well as increasing the ecological efficiency of existing buildings, can limit the environmental impacts of contemporary architecture. In fact, that is increasingly common for architects to suggest that we should understand and follow nature. It is high time that the mechanistic mental model ('the house as a machine needed to live') was replaced by 'the building as an organism' living in symbiosis with the other components of the ecosystem.

Questions

1. Give examples of natural and local building materials.
2. How could their use in building construction be increased?

Chapter 7.

Supply chain management

7.1. Introduction

In December 2001, during a very intensive period of Christmas shopping, the Dutch authorities withheld an entire batch of Sony PlayStation consoles that were destined for European market. 1.3 million boxes in total were sent into storage instead of going to the shops. The reason for not putting these products on the market was that they exceeded the permitted quantity of cadmium in wires, allowed by Dutch standards. Although Sony had managed to replace the faulty wiring in order for their consoles to reach the market by mid December, the delay caused by replacing wiring in these and other products, in addition to identifying and removing the problems caused by a supplier that had not met required standards cost the company 110 million euro. This required inspection of over 6000 factories and brought in new system of supply chain management, with the main goal of preventing similar problems reoccurring in the future (Sony, 2001; Esty and Winston, 2009, pp. 1–2).

Nowadays companies increasingly outsource their production, focusing their efforts on marketing and branding. However, they retain responsibility for their products to the authorities and consumers, which means they need to control their suppliers and influence customers through sustainable supply chain management. A lack of this kind of cooperation or limited cooperation can have huge costs for companies, as demonstrated by the experience of Sony and others who suffered the consequences of negligence when bringing products to market. This is a lesson that has been learnt by companies that have been widely criticised for not ensuring that their subcontractors in developing countries followed social and environmental standards. In the 1990s, a number of these cases were revealed to the public (see for example Klein, 2000) and forced global corporations to pay more attention to cooperation with their suppliers. After the large corporations started to implement sustainable supply chain management, many small companies followed their example.

The least complicated supply chain consists of a supplier, a particular company and its customers. However, most suppliers also use products and services delivered by their subcontractors and many customers further provide products and services to their customers, in a similar or modified condition. In the broader sense supply chain also includes other entities involved in adding value to a particular product or service, for example providers of capital and logistic or marketing companies. These entities join the different links of a supply chain, for example a capital donor links a particular company with its suppliers, and a marketing company with the final customers (Mentzer et al., 2001). Thus, suppliers are defined here as all the direct and indirect providers of products, semi-finished products, resources and services including the use of intermediaries and subcontractors.

Supply chain management is based on systems thinking (see chapter 2) and provides an example of complex relations between the components of a system and can be relatively easily understood by most managers. Sustainable supply chain management emphasises that every company is a part of a system within a larger system, that is social and natural. Managers build relations between these systems by cooperating with suppliers, customers and other stakeholders (see section 7.2).

Sustainable supply chain management requires the identification of the most important elements that affect the environment and society. Some links in a supply chain (called chain leaders) make a huge impact on the whole chain, so when constraining the chain's impact their involvement is required (see section 7.3). Moreover, external stakeholders that intend to influence a supply chain should also focus their attention on influencing these chain leaders. In conclusion, it can be noted that solutions implemented by large corporations can also be applicable to companies operating at smaller scales (see section 7.4).

7.2. From environmental management systems to sustainable supply chain management

The basic environmental requirements concerning cooperation with suppliers were introduced by the popular standards on environmental management systems. In order to complement the environmental standards with social ones, companies are now tasked with implementing sustainable supply chain management. This requires not only influencing suppliers (upstream) and customers (downstream), but also cooperating with other stakeholders (figure 7.1). Sustainable supply chain management requires the identification of and focus on the most important elements of environmental and social impacts.

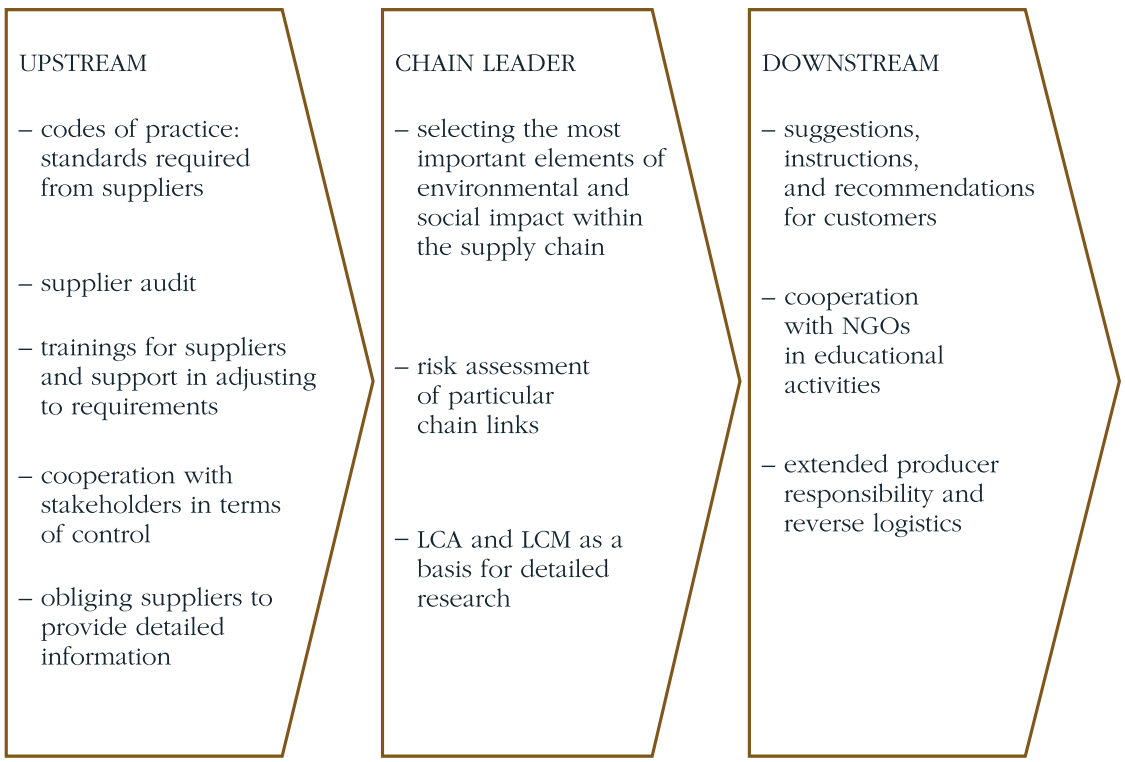


Figure 7.1. Tools used to promote sustainable development in a supply chain

An environmental management system (EMS) improves the general management system and regulates relations between an organisation and the environment. Although every organisation can design its own EMS, the ISO 14001 standard has turned out to be the most popular. Even the European Union's Eco-Management and Audit Scheme (EMAS) refers to ISO 14001 and complements it with its own additional requirements.

ISO 14001 specifies the control of the relevant environmental aspects of an organisation's activities, including its products and services delivered by its suppliers (ISO 14001; article 4.4.6). Thus, it is necessary to design and sustain procedures that also control suppliers.

Additionally, the EMAS regulation emphasises cooperation with suppliers, in order to extend the positive impact of environmental management beyond the registered organisations. In the case of EMAS, suppliers' activities are treated as examples of the key indirect environmental aspects of any organisation. Compared to ISO 14001, EMAS places emphasis on providing information about the environmental impact of an organisation and its actions within this area (for example preparing short environmental reports, known as EMAS statements, is obligatory). Information therefore should help to multiply the positive effects of EMS implementation beyond the registered organisation, for example by increasing the environmental awareness of the report's readers.

Implementing an EMS conforming to ISO 14001 or EMAS requirements, does not in itself justify describing an organisation as 'environmentally friendly'. Implementation merely means that it has fulfilled the legal requirements, has a system of procedures concerning its environmental impact, and strives for continuous improvement (even if minimal) in terms of environmental management. Operational management is described as the key issue in EMS because it places emphasis on preparing and maintaining procedures and precise responsibilities for particular employees. With regards to these systems, the obligation to extend environmental requirements to suppliers is often implemented through suppliers' declarations stating that they conform to the purchaser's policy. Therefore, companies that wish to demonstrate their contribution to sustainable development need to take further, and more elaborate steps.

ISO 14001 and EMAS determine the right direction. Indeed, environmental impacts can successfully be reduced by voluntary cooperative actions carried out by companies linked within a supply chain. This can be encouraged through increased communication and, especially through sharing information on environmental impacts of their common product or service flows. In chapter 5, we introduced two tools of environmental management that can be used for the purpose of studying and mitigating environmental impacts within a supply chain: the LCA and eco-design (tools 5.T1 and 5.T2). Here, we add three more tools: the supplier audit, green public procurement and eco-labelling (tools 7.T1, 7.T2 and 7.T3). Within sustainable supply chain management, the different entities cooperate in order collectively to reduce the environmental and social impacts of the whole chain, i.e. from extracting resources from the environment, creating and using a product, through to product reuse and its end-of-life management.

When the entities of the supply chain wish effectively to influence the product life cycle, they need to act both upstream and downstream, and influence everything that happens to the product before it gets to a particular link in the chain and even after it is supplied to the end user.

7.2.1. Upstream influence

Influencing the upstream part of a supply chain (the *pull* strategy) involves cooperating with suppliers. This may be aimed at environmental protection, eliminating child labour, and keeping the correct workplace, health and safety standards. In each case, the chain leader should choose activities most relevant to the particular chain and address its most important impacts or places where interventions would be most effective.

The standards to be used within a supply chain can be based on the established guidelines of international organisations (such as the International Labour Organisation), and including non-governmental organisations (such as the Fair Labour Organisation), or alternatively new standards can be developed in cooperation with them. Although existing international standards prohibit for example the use of child labour, they are frequently not obeyed by suppliers in a number of countries. Such problems can often be eliminated through audits of suppliers (tool 7.T1; see also Preisner and Pindór, 2000) and commonly used corrective actions.

Extending the chain leader's environmental and social criteria to suppliers usually leads to a more permanent cooperation. From the perspective of a purchaser, the transaction costs related to a change in supplier (searching, training, controlling, and even financial support for adjusting to requirements) are significant enough to justify maintaining cooperation with a current supplier. From the perspective of a supplier, costs once made to adjust to the purchaser's requirements make them receptive to renegotiated conditions in future.

To understand the need to change suppliers' behaviour, it is often useful to visit their factories, especially if they are situated in developing countries. Such 'staggered' visits can happen accidentally, for example during manager's private journey, or can be organised for employees responsible for supply chain management (Laszlo, 2003). It may turn out that a company that seems to be a leader in sustainable development in its country may procure products or services from suppliers that exploit employees or damage natural environment in another country. This kind of situation may get worse if these facts are revealed by somebody from outside of the company, for example in the media, before the company has managed to change supplier behaviour. The same effect can be caused by an event, such as that in the PlayStation 'cadmium crisis' or in a tanker accident where each oil spill can reinitiate a discussion in the media on mandating the use of more expensive double hulled tankers. This puts pressure on companies who order services from suppliers that are still using single hulled tankers.

Sustainable supply chain management requires engaging with employees, especially those who are responsible for placing orders. Without their involvement even the best supplier criteria and codes of practice will not help to achieve the desired results. Hence, as a first step in implementing this strategy, companies sometimes need to send their employees to developing countries or to suppliers that do not keep standards so that employees personally see the need for change (Laszlo, 2003). Before the Patagonia company that produces sports clothes began to use organic cotton in place of ordinary cotton, they organised excursions for employees and suppliers so that they could personally experience the impacts of conventional cotton cultivation. Even though this was not profitable at the beginning, the company finally built a competitive advantage by producing organic clothes. Subsequently, other producers forced by the competition have to undertake similar actions.

Many other companies followed a similar scenario of intervening in the early stages of their supply chain in order to gain a competitive advantage. Already in 1990 in the United States, the Heinz company committed itself publicly only to process tuna that had been caught without harming dolphins, which increased the company's market share. In 2004, the clothing company Gap published a crucial CSR report containing data on its suppliers from all over the world and on how they followed social and environmental standards. This was a huge step towards building transparency regarding working conditions (Esty and Winston, 2009, p. 84). A year later, a similar report was also published

by Nike. In previous years, these two companies had suffered the consequences of their negligence in sourcing suppliers, especially with regards to labour conditions (see van Tulder and vander Zwart, 2006, pp. 279–288).

Requirements regarding environmental impacts can also be introduced into logistic and transport service providers. In logistics, decisions may have a strategic character (choosing a location close to suppliers or waste management companies so as to minimise the environmental impacts related to transportation), or an operational character (choosing trading partners or transport companies that fulfil certain criteria). The goal of these decisions is to find the most effective use of transport, by shortening distances, minimising the costs of transport and subsequently reduce oil consumption and pollution. Taking into consideration the externalities noted in section 1.3, when ordering transport or logistic services, one should consider whether the service provider offers rail instead of road transport (where possible) or intermodal transport (i.e. that involves the use of at least two means of transport). Demand for transportation may also be reduced by reducing product packaging. Finally, social requirements such as the working conditions of drivers can also be taken into account when choosing a transport company.

Although thus far discussions on sustainable logistics have mostly focused on reverse logistics (see the following subsection), increasingly they are extended to solving sustainability problems through the cooperation of companies within a supply chain (for example van Hoek, 1999; Piplani et al., 2008; Quariguasi Frota Neto et al., 2008). For example, such cooperation can include reducing to a minimum the product returns and related environmental and financial costs, or offering a quality after-sales service so that the product may serve the user as long and as effectively as possible (see section 8.3). Eventually, such actions also require cooperation with consumers and links that will influence the downstream part of a supply chain.

Tool 7.T1.
The supplier audit

Introducing the principles of sustainable development to cooperation with suppliers has the aim of securing the interests of customers and the whole of society. However, the risk of supplier negligence occurring accidentally or even on purpose still exists. To reduce this risk, companies have adopted policies and codes of conduct that specify the requirements that are the basis for supplier selection and their periodic assessment (audit). Obviously, cooperation should be based not only on control but also on continuous dialogue on purchaser requirements and the importance of these.

There are different forms of control available and choosing the most appropriate one depends on the risk assessment undertaken for various suppliers. Higher risk suppliers (i.e. those who are more likely to breach social or environmental standards) should be subject to stricter controls. In this case, it is necessary to define the rules of cooperation and control procedures as precisely as possible. Performing an audit within a global supply chain however is difficult and expensive due to distance, cultural differences, the complexity of products and the diversity of suppliers. However, it helps to avoid the even larger costs related to not fulfilling legal requirements or a loss of consumer trust, or even a boycott by dissatisfied con-

sumers, resulting especially in the use of high risk suppliers.

A supplier self-assessment questionnaire is one tool that can be used to support a proper audit, and carried out by a procuring company. Evaluation of this questionnaire determines further control actions needed.

Depending on the information needs of a purchaser, an audit can be carried out by a procuring company or by specialised auditors. In the company case, auditors should include the managers responsible for purchasing, sustainable development experts and other related professionals depending on the specifications of a given supplier. The use of specialised auditors is possible when there are external auditors specialised in evaluating conformance with certain standards that need checking (for example systems of social accountability, such as SA8000, or the basic conventions of the International Labour Organisation). Alternatively, an audit can be carried out by a local NGO that is informally acquainted with the supplier's activities and local culture. This solution reduces costs and makes an assessment reliable, but only if the NGO can guarantee its objectivity.

A good audit should assess the risk of a supplier disregarding standards established by the purchaser, and to the level of expense related to a given supplier and their significance and visibility within the supply chain. An audit should include an analysis of documents, interviews with employees and visits to factories. Depending on the degree of complexity of the information, it can be extended to additional stakeholders (for example trade union representatives, neighbours of the factory, and local NGOs). Other factors that can be checked include: knowledge of the purchaser's requirements among the supplier's employees and board members; the requirements that the supplier imposes on subcontractors; attitudes towards the requirements; actions taken to fulfil expectations; procedures followed in the case of difficulties in fulfilling requirements; overall monitoring; and a system of actions aimed at continuous improvement.

An audit should be carefully prepared, and include suggestions on how to open and close meetings, what kind of information in documentation should be examined and assessed, and finally how to prepare an audit report. It is important to prevent false answers from being given by intimidated employees, who may be coerced into being dishonest. In justified cases, an audit performed by surprise (that is unannounced) or at short notice can be a good solution. A precise interpretation of audit results is also very important.

An audit can reveal when a supplier does not adhere to certain standards, codes or recommendations, and can eventually inform the decision-making on the beginning, continuing or ending a collaboration. However, an audit may also suggest how these deficiencies may be repaired. A series of audits carried out in different supplier companies can help to identify recurring problems that require a systems approach (for example a change of code in order to customise to local specifications) or to make adjustments to the audit procedure. In some cases, companies decide to carry out independent, external verification of their suppliers' evaluation system, in which case further auditing the work of auditors is also necessary.

The majority of companies emphasise that the main goal of an audit is to maintain sustainable cooperation with suppliers. Common decisions resulting from an audit and leading to corrective actions may strengthen cooperation. In order to fix deficiencies, it is much better to cooperate than to break off relations that might lead to factory being shut down and an increase in local unemployment.

7.2.2. Downstream influence

Influencing the downstream part of a supply chain (the *push* strategy) involves shaping customers' attitudes towards sustainable development (including end users). In order to influence their customers, companies usually provide recommendations or advise, but sometimes they can also exert pressure. Cooperation with clients is more important where there are negative environmental impacts than it is in the case of social impacts. As we noted in chapter 5, the most significant environmental impacts of many products occur during their use phase. In this case, knowledge on how consumers can minimise the environmental impact is crucial. For example, some car producers offer free trainings on economic driving that reduces petrol consumption, and provide similar information in the car manual.

McDonald's for example produces a lot of waste, 30% of which is liquid. In Sweden, in order to reduce the weight of landfill waste, McDonald's asked customers to sort waste by putting liquids and ice-cream into separate container. Over 75% clients followed these instructions, as a result of which the weight of waste was reduced by 25% and significant savings followed. However, in the United States, the same solution failed demonstrating that companies need to carefully assess the probabilities of client cooperation (Esty and Winston, 2009, p. 241). In the majority of cases, if it is not beneficial for the customer (for example in terms of savings of finance or time), then they will not cooperate. Thus, a company must try to convince customers to cooperate by offering them small benefits.

Influencing the downstream of a supply chain can also be carried out within through the notion of extended producer responsibility that obliges producers to take products back from consumers at the end of their useful life to ensure their end-of-life management. Although this can be voluntary, most often it is imposed on producers as a legal obligation. The goal of extended producer responsibility is to limit the amount of products dispersed into the environment and to reduce the amount of resources extracted from the environment. Centralised management of end-of-life products by producers who know them best ensures that they are properly reused and recycled. This forces producers to internalise partially or the entire costs of collection, recycling and sometimes landfill of products. This also relates to an obligation to provide consumers with information about the product and its impacts on environment during its whole life cycle, and to put in place an efficient system of product take back.

Thus, sustainable supply chain management involves all entities responsible for production, distribution, use and the collection of final products from customers (i.e. regeneration, reuse, reprocessing and recycling) and finally waste management. Additional links can be established with government and other stakeholders. In some cases, it is necessary to go beyond the traditional thinking on suppliers and purchasers within a supply chain. For example, the use of many products requires access to natural resources, such as clean water. In sub-Saharan Africa, Procter & Gamble cooperates with consumers and stakeholders to ensure the access to clean water for its products (i.e. water based preparations and mineral supplements) (Laszlo, 2003).

Finally, trade intermediaries play a special role in a supply chain. Because of their scale, large chains of various superstores can be very successful in introducing and enforcing sustainable development standards (case study 7.C1). Indeed, global distribution chains increasingly undertake sustainable supply chain management activities. These include Wal-Mart, the biggest distribution chain in the world. Although it is often criticised for exploitation of employees (through low salaries, banning of trade unions,

and limited heath insurance), at the same time Wal-Mart declares that it reduces its impact on the environment by cooperating with 70,000 suppliers. Aiming to reduce energy consumption and the amount of waste, the company introduced a range of requirements for suppliers, including an obligation to provide information on energy consumption during production and distribution (Esty and Winston, 2009, p. 85).

The example of Wal-Mart shows that a large scale purchaser can exert a huge influence on the whole supply chain and can introduce substantial changes (which we explore more in the following section). However, it also demonstrates that looking at some activities of a company, without reference to others, an inaccurate image can be presented. In spite of the abovementioned attempts, it is hard to say whether or not Wal-Mart is a sustainable company (see tool 14.T1). Sustainable supply management only becomes a fully comprehensive tool when it is based on life cycle assessment (LCA) that includes social requirements (SLCA or LCWE). When LCA, or at least a life cycle approach, is integrated within a system of organisational management, it is life cycle management (LCM). LCM itself requires increased cooperation between the different links in the supply chain and careful selection of suppliers and component products.

7.3. The buyer who dictates delivery conditions

The examples of the large companies show the level of influence that they exert on suppliers, in order to gain an advantage in the market or to prevent issues related with potential negligence. Often, these actions result from social pressure, which includes pressure from public institutions and the principles of sustainable development in their procurement policies. Sometimes, to increase their influence on suppliers, companies cooperate with other purchasers in applying common procurement criteria. This requires product identification and the provision of reliable information, and finally and most importantly, consumer and NGO engagement.

7.3.1. Challenges

Gold mining for example poses high environmental and social risks in that it causes long-term changes in ecosystems, requires the use and storage of huge quantities of dangerous chemical substances, and is very often a source of conflict with local communities near gold mines. However, gold is a standardised product and it is difficult or even impossible to know its place of origin once it reaches the international market. Tiffany & Co., the large jewellery company, worried of the market consequences of loss of demand for its products if associated with gold mining issues, decided to buy its gold from one supplier only. Rio Tinto was chosen, a company which 20 years ago had been widely criticised for causing environmental and social problems, but since then had become a leader in sustainability in this area in the mining sector (Diamond, 2005, p. 467).

DuPont, the chemical company, provides a similar example. One of ingredients used in its products is titanium, most of which comes from Australia. Although DuPont does not extract titanium compounds from the environment on its own, it takes responsibility for mining companies and imposes on them its own requirements (Diamond, 2005, p. 467). McDonald's is another example. It enforced higher meat quality standards within several weeks, whereas legislators in the United States had not been successful in doing this in 5 years (Diamond, 2005, p. 484)! Tiffany & Co., DuPont and McDonald's are large purchasers, but ultimately they are responsible to consumers for their products. Due to the large scale of purchases and a leading position in the supply chain, they exert an effective pressure on suppliers.

The majority of business activities related to sustainable development are initiated in response to stakeholder pressure, and not by companies themselves (Esty and Winston, 2009, p. 68). Consumers expect products not only to be cheap, but also to be safe and, increasingly, produced in an environmentally or socially friendly manner (see chapter 14). If consumers and NGOs manage to identify the key links in the supply chain, they can influence those who have the biggest power, or those who are strongly motivated because what they care about most is their image. Also, because the character, composition and other features of products are influenced by those who offer them to consumers, they have to put pressure on suppliers. Importantly, risks related to the supply chain appear in every industry, and for example even banks have to pay attention to the suppliers of cash machines. If it is found that machines use too much energy or contain banned substances, an environmental NGO that finds it out will not embarrass an unknown supplier but the bank that owns the logo on the machine.

Strong and effective public control, i.e. pressure exerted by buyers, including business and public purchasers, contributes to reducing demand for any product that is shown to harm the environment or society, pressure that also encourages the growth of companies that behave in a responsible manner. 'Watching carefully how every penny is spent' does not mean spending as little as possible but spending wisely, particularly essential for public institutions. They should not only operate at the lowest cost but also shape the world around them. This can be supported by including sustainability criteria in public procurement (tool 7.T2) and product standards. There are also possibilities to introduce obligations for preferred given solutions in projects financed with public funds. Because of the scale of their activity,[1] public institutions may support development of new technologies or even simple solutions, such as recycled paper, that would otherwise not be profitable. For example, green public procurement is promoted and implemented by the European Commission, and it is also popular in most other developed countries. For example, all suppliers of the 2010 Winter Olympics in Vancouver were subject to sustainability-related criteria.

Tool 7.T2.
Green public procurement

According to the European Commission requirements green public procurement (GPP) is a policy under which public entities seek solutions that limit the negative effect of products and services on the environment and thus contribute to the development and popularisation of environmental technologies. Detailed recommendations regarding the consideration of environmental aspects are contained in directive 2004/18/EC on the coordination of procedures for the award of public works, public supply and public service contracts. Similar rules were introduced by directive 2004/17/EC in coordinating the procurement procedures of entities operating in water, energy, transport and postal service sectors. In these directives it is stated that 'contracting authorities that wish to define environmental requirements for the technical specifications of a given contract may lay down the environmental characteristics, such as a given production method, and/

[1] In the EU, public procurement represents approximately 16% of GDP.

or specific environmental effects of product groups or services. They can use, but are not obliged to use appropriate specifications that are defined in eco-labels'. In practice, these environmental considerations can be introduced into tender procedures at the individual stages of procurement in the following ways.

1. Determination of needs and definition of the subject of a procurement concerns preparatory activities for drawing up a technical specifications and assessing the value of a procurement. Environmental and cost aspects should be considered for the entire life cycle of the product, including its use and end-of-life management. This is a significant change to the approach for the evaluation of products and investments (technologies) in that it is based on the idea of the life cycle. Results of examinations carried out by a life cycle assessment method (LCA, tool 5.T1) can be used to specifying the needs of a procurement from the perspective of its impact on the environment, while the life cycle cost method (LCC) can be used for specifying these from an economic point of view. Such an approach is recommended in criteria prepared by the European Commission for its ten designated priority groups of products and services. For example, in construction works the description of procurement defines that an architect's experience in using LCA and LCC tools in project preparation (see chapter 6) is one of the GPP qualification criteria.
2. Formulation of technical specification concerns the preparation of information and rules for prospective participants in a given procedure. Parameters regarding the environmental aspects must be precise enough to enable the contractors to determine the subject of a procurement and inform the contracting institutions who award the procurement. In Poland, Public Procurement Law of 29 January 2004 refers to the specification of functional requirements that may have an impact on the environment (art. 91, section 2), or in other words whether or not a given product meets its environment related function. The European Commission's criteria for cars and light vehicles indicate that the average emissions for new cars should not exceed 130 quantities of CO_2/km and that exhausts from vehicles must comply with the Euro 5 norm. With regards to construction materials, tenders must specify the percentage of their construction materials and products that comply with environmental criteria. For investment it is possible to invoke to the best available technologies described in BREF reference documents and that form the basis for obtaining integrated permits for certain industrial plants.
3. The qualification of contractors is specified by indicating environmental management measures that can be used by a contractor during work for procurement. For example, according to the European Commission's guidelines for construction works, tenders must disclose their technical capabilities in implementing specific measures for environmental management in meeting certain requirements for limiting waste at construction sites to the minimum or most effective use of energy and water.
4. Criteria to evaluate tenders that are the most economically beneficial do not mean that procurement is made at the lowest purchase price. In practice this is linked with the implementation of the LCC concept. Thus, the purchase price is not the only criterion for selection in the procedure, because cheap products often result in high costs of use in terms of energy consumption, the short time of use (quality and durability) and high costs for waste management.

5. The conditions for completion of procurement should in particular cover its social and environmental factors and also offer a guaranteed service, and quality assessment.

Two important GPP initiatives undertaken in the European Union are described below.

1. The preparation of a set of GPP criteria (through product cards) in relation to ten priority groups of products and services (cleaners and cleaning services, the construction industry, electricity, food and catering, furniture, gardening products and services, textile products, and transport). For those groups of products and services that concerned eco-labelling criteria, LCA and various other legal requirements (for example regulation no. 106/2008 dated 15 January 2008 on Energy Star energy-efficiency labelling of office equipment).
2. The communication from the European Commission on public procurement for a better environment (COM(2008)400 dated 16 July 2008) proposed that member states should strive on a voluntary basis to attain a 50% target of 'green' procurements in tendering procedures by 2010.

In Poland, implementation of high GPP targets in tender procedures requires preparation of detailed guidelines and rules (for example, in 2008 the Ministry of Economy adopted a document entitled 'A new approach to public procurement: public procurement and SMEs, innovations and sustainable development'), as well as raising awareness and promoting education among those who contract out and participate in tender procedures. It was a big challenge because the GPP share in Polish public procurement was about 5% in 2005. Tasks connected with education and promotion have since been implemented by the Public Procurement Office through a series of training exercises and conferences and by means of a handbook entitled 'Zielone zamówienia publiczne' (UZP, 2009). E-learning courses on 'Green public procurement – from ideas to practice' are also provided by the Foundation for the Promotion of Polish Communities.

a) procurement based 90% upon the price; and
b) 10% upon the use of CNG or hybrid powered busses (during the tender procedure, a LNG was included into preferred options, following a motion from one of the tender), according to the following formula:

$$\frac{\text{A percentage offered of gas or hybrid powered buses in the evaluated tender}}{\text{The highest offered percentage of gas or hybrid powered bus fleet among all tenders}} \times 10 \text{ points}$$

An interesting example of completion of green public procurement in Poland was the tender procedure announced in May 2009 for 'the provision of urban bus transport services in Krakow'. According to the procurement specification, the selection of a tender was made conditional upon two criteria:

In spite of a fear that with such conditions, it was possible for a tender with a only symbolic share of environmentally friendly buses to win, the tender procedure resulted in a very favourable outcome. The winner was Przedsiębiorstwo Transportu Samochodowego based in Krakow, with the tender submitted in accordance with sustainable development by offering a 100% LNG powered fleet (which was the preferred tender specification).

Thereby, after years of awarding procurements based on the lowest possible price, the social importance of public transport was finally appreciated (see chapter 11) and it was decided that an

element of quality, namely friendliness to the environment should be introduced.

The example described above is still one of few initiatives taken in Poland to introduce additional criteria that promote environmentally friendly solutions. But they do refer to the idea of life cycle costing (LCC) as recommended in the GPP because they enable introduction of solutions with higher investment expenditures (thus it is possible to offer a higher price) which can be cheaper in use for both the contracting party and for society (i.e. through lower external costs).

Finally, it is worth noting that it is important to have in place an integrated state policy that promotes activities for environmentally friendly technology. Had there been a coordinated system of economic incentives in place in Poland, there would have been more of these brave and beneficial procurements.

7.3.2. Solutions: joint activities of different companies

In order to increase their impact, different companies can undertake joint actions regarding suppliers. Even small businesses can make economies of scale and influence suppliers, purchasing goods together or establishing common procurement criteria. Such activities can be performed or encouraged as follows:

- groups of companies from different sectors purchasing similar products together;
- sector purchasing groups; and
- general business organisations with the goal of promoting sustainable development among purchasers and suppliers.

The Paper Working Group is one example of an organisation that associates companies from different business sectors and carrying out joint purchases. This was created by a group of large companies, including the Bank of America, Nike, Time Inc. and Toyota, coordinated by the organisation Metafore. Partners defined the criteria for environmentally friendly paper, set equal requirements and tools for paper purchasing assessment, in order to increase supply and the price range for paper.

In another example of common purchasing standards established by different companies from one sector, the Electronic Industry Code of Conduct, was established for this purpose by leading American producers of software and electronics (including Dell, HP and IBM). The criteria included working conditions, health and safety, environmental impacts, ethics and management systems, and intended to encourage supplier effectiveness. Working as a group, purchasers benefit from economies of scale related to the enforcement of requirements and supplier training. Moreover, the group established a partnership with the Global eSustainability Initiative, a similar organisation, in order to further extend their influence on international suppliers. This partnership established common standards for supplier risk assessment, self-assessment questionnaires, audit methodologies and communication tools. Similar actions have also been undertaken in other sectors.

Sustainable development in supply chains is also promoted by organisations such as Action Sustainability in the United Kingdom, Acquisti e Sostenibilit in Italy, the BuySmart Network in Canada and the Responsible Purchasing Network in the United States. All these organisations support companies in sustainable supply chain management and public institutions for sustainable procurement. They organise training (some of which is free of charge), communicate with media and research institutions, prepare case studies, provide reports and supplier assessment tools, all of which can be found on the organisations' websites.

To illustrate the mechanisms mentioned above, we once again refer to the example of the Baltic cod (case study 1.C2). In autumn 2007, when the case of illegal fishing and the critical condition of the cod population was exposed in media of Western Europe, large companies and trade organisations significantly reduced or even entirely stopped buying Baltic cod. Birds Eye Iglo, one of the biggest producers of fish products, reduced its purchases of the Baltic cod by 80%. Similar decisions were made by certain trade branches in Western Europe. The EU Fish Processors Association (AIPCE), trade group for purchasing, made a statement criticising the irresponsible policy of the Polish government and established control instructions regarding the purchase of the Baltic cod. Those instructions were to assure that fish purchased originated only from legal fishing. Moreover, the actions of the large purchasers' and their decisions caused losses for Polish fishermen and helped to normalise the situation.

7.3.3. Solutions: traceability

The cod example shows that in order to influence suppliers, it is necessary to be able to identify the origin of purchased goods and to obtain information regarding their impact on the environment or society (which can be provided by a labelling system). Eventually, actions taken by particular entities within a supply chain depend on engagement with consumers and NGOs and it is this that warrants the subsequent efforts of producers.

Traceability is a condition for selective purchasing, especially with reference to standardised products, the features of which are similar regardless of their origin. The gold, titanium and fish examples noted above are such standardised products. Traceability allows us to trace the product across the whole supply chain: beginning from extracting it from the environment, its processing and distribution, to its final consumption. It allows us to eliminate from the market those products that were produced illegally and, if necessary, remove from the supply chain those products delivered by unwanted suppliers. This encourages suppliers to act according to established rules, and for purchasers and consumers to be certain of a product's origin. In the EU, a system of identifying fish products and resources is being prepared, with a pilot project being implemented in Poland between 2005 and 2008.

Traceability is the first step towards providing purchasers with detailed information on their products and eventually verified via independent controllers. A certificate may provide a visual confirmation, such as awarding a product with a label, confirming that this product fulfils particular social or environmental criteria. Eco-labelling programmes, introduced as tool 7.T3, provide an example of these kinds of actions. After introducing cod traceability, in 2008, the Swedish Federation of Fishermen introduced their eco-labelling system Närfiskat indicating that fish has been caught in compliance with regulations and the code of responsible fishing. The label also contains information on the fishermen who caught the fish in question.

A similar certification system was established in 1997 by the Marine Stewardship Council (MSC), in order to implement the sustainable management of fisheries on a global scale. One of the directors of Unilever, the company that initiated this system together with the WWF, noticed that being one of the biggest fish processing companies, Unilever had to protect marine resources to ensure its future operations (Esty and Winston, 2009, pp. 31–32). Yet probably the most popular and widely used eco-labelling programme in the world was established in 1993 by the Forest Stewardship Council (FSC) to promote sustainable forestry. Because the FSC certificate is often required by large purchasers, such as IKEA (case study 7.C1), it has been recognised by the majority of wood suppliers in Poland. Additionally, the

FSC offers a certificate that confirms responsible practice has been followed throughout the entire supply chain (FSC Chain of Custody). Finally, there is also a system of labelling that is focused on social issues, such as that created in 2002 by the government of Belgium, based on international conventions on labour conditions.[2]

Although obtaining a label means additional costs for a supplier, it enhances the supplier's competitiveness by adding value to its product or service. From the perspective of sustainable development, the external benefits provided by various labelling systems are particularly important. These benefits do not arise directly for suppliers, who bear the additional costs of compliance, but to the society as a whole. Sustainable use of the environment protects its various services (ecosystem services; see section 1.2), ensuring that the overall benefits of eco-labelling systems, such as FSC or MSC, are higher than their costs (Pearce and Pearce, 2001, p. 11). Similar external benefits are provided to society with reference to improved labour conditions in suppliers' factories and the improved quality of their cooperation with local communities. In this context, it is important to mitigate social tensions, for example related to the discrepancies in income between the workers who make a product and the consumers who use it, especially in the case of supply chains that link developed and developing countries.

In each of the above cases, producers and distributors chose suppliers, based on the use of sustainability criteria. Eventually, they do this on behalf of consumers, being aware of the importance of their position as intermediaries between suppliers and consumers, and because particular products and services are needed. Thus, the ultimate condition for sustainable supply chain management is consumer support (see chapter 14). Consumer engagement depends on their awareness, and this awareness can be raised by education provided by governmental and non-governmental organisations. Information is also necessary, as shown in the case of the Baltic cod, when information on problems led to decisions by foreign buyers to restrict their purchases of these fish.

Tool 7.T3.
Eco-labelling

Eco-labelling is one of the most important marketing strategies as far as differentiating products according to their environmental impacts is concerned. The most popular are labels confirming that a product conforms to a particular standard. Placing a label on a product or adding it to its documentation can also describe a particular feature, such as its recycled content or energy consumption.

There are three types of eco-labelling, each of which follow the ISO 14020 requirements:

- type I eco-labels which are granted by independent institutions (known as third party);
- type II eco-labels which are producers' own declarations; and
- type II eco-labels that are complex environmental product declarations based on LCA.

Labels provide consumers with information that helps them to make purchasing decisions. This is particularly important in the case of environmental product declarations that present

[2] The above examples refer to labels that can be obtained voluntarily. However, there are also obligatory labels, such as the CE sign confirming product's accordance with EU norms.

detailed information about a product's environmental impacts. Information specified on eco-labels is easily (type I and II) or relatively easily (type III) accessible and is especially useful when confirmed by external experts. From this perspective, type II eco-labels are the most controversial. Indeed, it is even the case that producers place on their products labels that imitate popular eco-labels, taking advantage of the fashion for environmentally friendly products (see also tool 14.T1).

There is a great variety of labelling systems related to sustainable development with regards to: employment conditions (for example Rugmark, Fair Wear, and Investors in People), conditions of production (for example FSC, MSC, and the Rainforest Alliance), recycling, products of natural origin, grown without artificial fertilisers (for example the EU 'organic farming' label), comprehensive environmental impacts (such as the EU eco-labelling scheme), and quality. There are also programmes that refer to several factors at the same time (such as Fair Trade, case study 14.C2). Seven examples of these labels are shown in figure 7.2.

Unfortunately, the diversity noted above may be the cause of information overload which can make it difficult to identify the most important issues. This happens if companies do not want to follow the requirements of an established system, and they create their own, less restrictive equivalent which may confuse consumers. Therefore, the recognised systems that have been operating for the longest time are the most trustworthy. However, even these systems cannot always enforce stricter standards because of pressure from the less restrictive competition (see van Tulder and van der Zwart, 2006, pp. 243–244). Moreover, these criteria should be constantly verified and actualised to reflect the development of sustainability knowledge.

Figure 7.2. Examples of eco-labels: the Polish 'Eko-znak', the EU eco-labelling scheme, the German 'Umweltzeichen', MSC, FSC, the EU labelling system for organic farming, and Fair Trade (see case study 14.C2)

Some actions have been undertaken to integrate different systems, especially in the EU, where several programs of labelling exist in parallel, including one coordinated by the European Commission. The German Umweltzeichen, created in 1977, was the first eco-labelling system in the world; whilst the common EU scheme (type I) was introduced in 1992 (as amended in 2000 and 2009). By the end of 2009, almost 25,000 products were eco-labelled within the EU scheme and were available on the market (but including only 18 from Poland). These eco-labels are granted on the basis of a simplified LCA for each product (invoking the so-called life cycle considerations). After a product has been labelled by an EU label, it is promoted by the responsible EU and national institutions, as well as by the consumers and environmental NGOs involved in the scheme. The European Commission promotes an EU eco-labelling scheme alongside green public procurement (tool 7.T2), highlighting that it is easier to choose a labelled product than to define one's own criteria and then verify them. In Poland, EU eco-labels are granted by the Polish Centre for Testing and Certification (PCBC), which has also since 1998, administrated the Polish eco-label ('Eko-znak') which to date has been awarded to about 100 products.

However, eco-labelling systems (including the EU one) have been criticised for being based on comparisons within narrow product categories, instead of widely understood product systems, that provide the same service. The latter would in general allow us to choose a more environmentally friendly option. For example, the different means of transport available should be considered within the same category (with reference to a functional unit, such as a 10 km distance travelled to work 5 days a week), instead of say treating cars and buses separately (Kronenberg, 2007a, p. 159; see section 8.4).

In summary, although certification systems were created in order to make a purchasing decision easier, in fact they have often become a handicap. Apart from the most recognised systems, purchasers who want to make responsible decisions still need to verify the criteria of labelling systems and the effectiveness of their oversight. Thus for purchasers, especially large ones, it might be more beneficial to establish their own procurement criteria.

7.4. Summary and conclusions

In chapter 1, we emphasised that sustainable development is a criterion that is often used by various donors of public and international funds. In this chapter, we focused on how a similar approach is applied in business. Environmental protection, appropriate working conditions and respecting local communities may decide the establishment or maintenance of cooperation between companies. Indeed, the obligation to influence suppliers is incorporated into the major standards regarding environmental management systems, and in a more advanced form as sustainable supply chain management.

We have listed both relatively easy solutions, which can be applied in any organisation (such as codes of practice and supplier standards), and more complex tools, applied mostly by large companies (supplier audit, and extended producer responsibility). In fact, any solution can be adjusted to the scale of a particular entity, and it is also possible to create other tools, focused on particular issues, that are relevant from the point of view of a particular sector or company.

Sustainable supply chain management has to be integrated with all the activities of a company and across the whole supply chain. This should refer to the most important

environmental or social aspects of the entire chain. The criteria used within it should be as detailed as possible, based on quantifiable measures, preferably combined with an overall management system or a sustainability management system for the company. Notably, introducing detailed requirements is easier for environmental than it is for social impacts.

Sustainable supply chain management can be applied both in global corporations and in local or regional business (such as a bakery or fish smokehouse). In any case, companies undertake actions in order to offer more competitive products, emphasising particular features (value added) relevant to the final consumers. For this reason, it is important to control and choose suppliers that take best care of society and the environment. Assessing them requires an integrated and interdisciplinary approach (see part I) and encourages innovation. Innovation can further be promoted through making the best of product functions, which we shall explore in more detail in the following chapter.

The complexity of products and supply chains, that link all actors in a product's life cycle, implies not only a need for common actions but also for a common policy that will implement changes across the whole supply chain. Green public procurement and new policies, such as the EU Integrated Product Policy, provide examples of the policy responses in this regard. Such policies therefore adopt an integrated and interdisciplinary approach that is based on extended cooperation and exchange of information within the supply chain (Kronenberg, 2007a).

Practical resources

ISO 14001:2004 – *Environmental management systems – Requirements with guidance for use*. An international standard that includes requirements regarding cooperation with suppliers.

Regulation No. 1221/2009 of 25 November 2009 on the voluntary participation by organisations in the EU eco-management and audit scheme (EMAS) that extends the ISO 14001 requirements to cooperation with suppliers.

Regulation No. 66/2010 of 25 November 2009 on the EU Ecolabel that describes the rules for establishing and using the voluntary EU eco-labelling scheme.

One of the useful educational tools concerning supply chain management is the beer game, in which players decide the size of beer supply (Senge, 1990). Although it does not concern environmental or social issues, it demonstrates the complex character of a supplier management system. Including the above additional criteria makes the system even more complex and difficult to manage.

Websites of organisations or labelling programmes mentioned in this chapter also provide more information on the related criteria and ways of supplier assessment, as in the following examples:

- Acquisti e Sostenibilità <www.acquistiesostenibilita.org>;
- the Action Sustainability <www.actionsustainability.com>;
- the BuySmart Network <www.buysmartbc.com>;
- the social label of Belgian government <www.social-label.be>;
- the Forest Stewardship Council <www.fsc.org>;
- the Marine Stewardship Council <www.msc.org>;
- the Responsible Purchasing Network <www.responsiblepurchasing.org>;
- the EU eco-labelling system <www.ec.europa.eu/environment/ecolabel>.

Questions

1. Give examples, other than described in this chapter, of situations where a change of supplier behaviour was caused by: (1) consumer pressure; (2) public institution pressure; and (3) business partner (purchaser) pressure. How did they come about?
2. As we mentioned in this chapter, strong and effective public control contributes to reducing the market for products that are harmful to the environment and to society, and encourages the growth of competitiveness in companies that act according to the principles of sustainable development. What is the level of social control of company activities in your country? And what causes it?
3. Organisers of huge international sports events increasingly place emphasis on the principles of sustainable development, for example the 2010 Winter Olympics in Vancouver or the 2012 Summer Olympics in London. Sustainable development principles were for the first time, introduced in the 1994 Olympics at Lillehammer. Why is that the organisers of the 2012 UEFA European Football Championship do not place emphasis on sustainable development? What steps could be taken to make this event more sustainable?
4. What obstacles do companies' face in cooperation for common purchasing? How can they be overcome?
5. The example of Procter & Gamble, mentioned in subsection 7.2.2, showed that companies can make a profit by responsible actions in developing countries. This corresponds to the *Fortune at the base of the Pyramid* concept (see Prahalad, 2005). Because the basic needs of people living in developing countries often have not yet been satisfied, how does this affect sustainable development and sustainable supply chain management in particular?
6. What are the obstacles to green public procurement in your country? How can they be overcome?
7. Why is that not every eco-labelling system can be trusted? What criteria can we use when choosing programmes that we can trust?
8. Audits carried out at a supplier's factory may not show any negligence if a supplier is forewarned of the audit and a response is well arranged. How can an audit be made more effective, so the outcome provides a true picture of a company?

Case study 7.C1.
IKEA: 'low prices, but not at any price'

The case of IKEA is illustrative of an experience shared by many international corporations. Due to accusations of abuse of employee rights and environmental impacts that resulted in public pressure, the company decided to better manage its relationship with its suppliers. IKEA designed frameworks for supply chain management (obligatory also in Poland), as a part of the company's global strategy. They also needed to manage their relationship with the stakeholders beyond the supply chain, whilst still aiming to solve issues within it.

The first of IKEA's problems with suppliers was compliance with requirements driven by customers and the authorities of West European countries since the early 1980s. In 1992, a production stoppage in Germany due to use of a varnish that contained more hazardous substances than the law allowed cost IKEA 6–7 million dollars (SPN, 2007, p. 21). Further revelations that came to light in the years that followed revealed the use of child labour by IKEA's suppliers, unsafe working conditions at IKEA's supplying factories in developing countries and in Eastern Europe along with the use of illegal timber from tropical forests, all of which caused further damage to the company's reputation (van Tulder and van der Zwart, 2006; Esty and Winston, 2009).

Even though IKEA presented itself as a responsible company and claimed to have been working with its suppliers as early as in the 1970s (Edvardsson and Enquist, 2008), it was public pressure in the 1990s that drove the company to intensify its actions in corporate responsibility. In 1999, the company pledged to take measures to sustainably manage their supply chain in future. Soon after that pledge, in 2000, IKEA introduced its IWAY requirements (IKEA Way on Purchasing and Distributing Home Furnishing Products),[3] a system of codes on the purchase and distribution of IKEA's products. These requirements were obligatory for all members of the IKEA group and for all of the company's suppliers. The complexity of the issue, however, was illustrated by the fact that in 2008, IKEA worked with 1380 suppliers of home furnishing products (in 54 countries), 263 companies in the transport and logistics services sector, 76 food suppliers, and 50 advertising service providers. 17% of IKEA's supplies came from Poland (at 2nd place; the 1st place belonging to China with 21% of supplies; and Italy at 3rd on 8%).

The IWAY system of codes

The IWAY system of codes consists of separate documents that describe the company's expectations towards its suppliers of home furnishing products, food and advertising materials and for providers of transport and logistics services. Overall frameworks for cooperation are regulated by two IWAY standards on purchasing and distribution. Additional documents highlight IKEA's policy on child labour, timber traceability, management of hazardous waste, and audit procedures.

The IWAY standard refers to the UN's and International Labour Organisation's conventions and declarations. The codes specify what compliance is required with and how the requirements should be monitored in practice and what the consequences are of not following requirements. Suppliers commit to passing on these requirements down the supply chain (to sub-suppliers).

[3] The company's policy regarding their suppliers (including IWAY codes) is described on IKEA's website and in IKEA's reports on sustainable development, for example IKEA (2008).

The core of the IWAY approach consists of the basic requirements presented in table 7.1. Training organised by the company in addition to financial support, audits and corrective actions all aim at ensuring compliance with the IWAY requirements. Worldwide there are about 80 IKEA office workers and 18 foresters who are responsible for this, and who visit and evaluate suppliers. When the suppliers are unable to fulfil company's requirements, cooperation is terminated. In 2008, IKEA parted ways with 20 suppliers who did not comply with IWAY, and in a further 28 of cases, a lack of compliance was one of the reasons for terminating cooperation. Moreover, since the introduction of IWAY, several purchasing managers who did not follow the code were dismissed.

Table 7.1. IWAY's basic requirements (IKEA, 2008; <www.ikea.com>)

Compliance with regulations	– national and international; – environmental protection and working conditions.
Entry requirements (necessary condition for initiating cooperation)	– suppliers must not: make use of child labour, or make use of forced labour, or cause significant environmental degradation, or pose serious safety threat; – suppliers must: keep a record of working hours and ensure accident insurance for their employees.
Working conditions	– compliance with basic human rights, treating employees fairly and with respect; – suppliers must: provide a safe and healthy working environment; ensure buildings are safe, provide reasonable privacy, quiet and personal hygiene (if housing facilities are provided); pay at least the minimum legal wage and compensate for overtime; – suppliers must not: discriminate; use illegal overtime; prevent workers from associating freely with any workers' association or group of their choice; accept any form of mental or physical disciplinary action, including harassment.
Environmental protection	– constantly work to reduce impact on the environment; – work to reduce waste and emissions to air, ground and water and use of energy; – ensure proper management of hazardous waste, contributing to the recycling and reuse of materials and products.
IKEA's obligations	– to be responsible to their suppliers and to support them in complying with IWAY; – to respect different cultures and the environment.

IKEA's aim was to ensure that all their suppliers fully comply with the requirements set by the IWAY standards. However, the realisation of this goal is happening at a much slower rate than hoped for. By 2008, only 7% of IKEA's Chinese suppliers of home furnishing products fulfilled all the requirements. In comparison, in Europe, 81% of suppliers complied with IWAY. The following examples of areas covered by IWAY (such as use of child labour, purchases of timber, food and logistics services, audit procedures, and cooperation with customers and other stakeholders) demonstrate the complexity of IKEA's supply chain management.

IKEA's policy regarding child labour includes informing suppliers why children should not work and controls are conducted (often unexpectedly) to check whether suppliers fulfil their own declarations. If a supplier is found to be using child labour, it

is then obliged to provide compensation for the children in the form of education, with provision of such compensation subject to IKEA's audits. Besides the obligation to prevent the use of child labour, the supplier is excluded from IKEA's operations for the period of six months during which IKEA does not place any new orders.

IKEA admits that it is not able to guarantee across its whole supply chain there are no instances of child labour. According to the company this is a result largely of institutional failures in supplier countries of origin (see section 1.5). However, the company does its best to eliminate this problem.

In its policy regarding timber purchasing, IKEA has declared that:

- it will not purchase timber from areas of high environmental value;
- it will not purchase wood from illegal logging; and
- it will only purchase timber from forests managed in a certified and sustainable way.

The management of relationship with the suppliers is organised around the 'staircase model' (figure 7.3). Levels 1 and 2 relate to basic requirements for timber tracing, compliance with the law, elimination (from the supply chain) of timber coming from protected areas and other areas of high environmental value as well as timber from plantations established after 1994 in places where forest clearance had previously taken place. The 3rd level includes procedures for cooperation with other members of the supply chain network. Level 4 requires external verification, currently only according to the FSC standard.

Figure 7.3. The 'staircase model' applied by IKEA while purchasing wood (IKEA, 2008; <www.ikea.com>)

When it comes to the food suppliers to IKEA, in addition to the IWAY standard, IKEA employs additional requirements regarding product quality and its environmental impact. For instance, IKEA would not accept endangered fish species, including cod caught in the Baltic Sea. The first control of IKEA's food suppliers' compliance via IWAY took place in 2008 and even though only 13% were found fully accord to IWAY, IKEA was hoping for 100% compliance by 2009. Advertising material providers, besides complying with IWAY, had to additionally satisfy requirements regarding, for instance, paper quality.

In 2009, IKEA hoped that 30% of their timber would be provided by level 4 suppliers and 100% by level 2 suppliers. The company's long-term goal is to purchase wood only from level 4 suppliers. The team of foresters mentioned above were responsible for the company's relationship with their suppliers of timber. The team is also in charge of providing the necessary education to suppliers on sustainable forest management. A closer relationship with suppliers has also resulted in elimination of middlemen from the supply chain.

With reference to transport and logistics service providers, IKEA requires them to use modern vehicles, and meet their own emissions reduction goals over a period of three years. The company supports exchange of good practices between the providers of these services. Nevertheless, the railway's share in transportation of IKEA's goods has been falling and in 2008, only 4% of volume of IKEA's goods were transported by train, while 69% went by road.

Finally, the IWAY standard establishes an audit procedure for its factories (including opening, visiting, documentation, employee interviews, closing, and reporting) and indicating who is responsible. The audits are aimed at supporting implementation of IWAY standards. Each supplier is audited at least once every two years, or once each year in the case of Chinese suppliers. When necessary, the auditors assist the supplier in designing corrective actions and then check on the progress of the actions. In some countries, for instance in China, IKEA offers special support in complying with IWAY. While the audit criteria are the same for all suppliers, the character of audit is not universal in all cases, in some instances it can be announced, in others not. For instance out of 693 audits carried out in Asia in 2008, as many as 359 (52%) were not announced beforehand. Meanwhile, in Europe only 21 out 480 audits (4%) were unannounced. External auditors are responsible for evaluation of the system overall and for the work of company auditors in dealing with suppliers.

Cooperation with other stakeholders

As a part of its sustainable supply chain management IKEA also influences its customers. An example of such collaboration is the IKEA range of products which customers can assemble by themselves. This solution, which has been successfully employed by IKEA since the mid 1950s, allows for the products to be packed in flat parcels which in turn allow for more effective use of transportation, resulting in lower emissions. Other examples of IKEA's work with their customers include:

- encouraging customers to return end-of-life products, such as energy-efficient bulbs, so that they can be properly treated;
- elimination of free disposable plastic bags since 2006 (and in Poland since 14 September 2007) and promotion of multiple-use bags; and
- encouraging customers to partake in noble initiatives, such as charity fundraising organised by IKEA in cooperation with UNICEF and Save the Children.

The last of the examples above involved IKEA's cooperation with other stakeholders that aimed at supporting their efforts in sustainable supply chain management (IKEA, 2008, p. 9). A project run by IKEA, UNICEF and Save the Children had the aim of improving the situation of children in developing countries. The organisers hoped that healthier and better educated children could contribute to a better society that will oppose the use of child labour. Cooperation with the WWF aimed to stop illegal logging in Siberia and the transportation of timber to China (including lobbying aimed at introducing legal restrictions in Russia, cooperation with customs officers, and education of

foresters and controllers). The project not only protected forests but also prevented a 'spoiling of the market' from the introduction of illegal timber (i.e. preventing the increase of external costs connected with lowering the competitiveness and sales of timber coming from legal sources).

Conclusions

IKEA's initiatives on sustainable supply chain management were a result of many events worldwide in the past and IKEA's long term experience. In Poland, these initiatives have been implemented as part of the corporation's global strategy. Referring this situation to the Polish setting, it is worth noting that big companies, such as IKEA, can play an important role, for example in stopping the logging of the Białowieża Forest and in protecting this natural heritage (see case study 1.C1). This would require big companies to explicitly refrain from purchasing timber originating from this area. Supported by an advertising campaign, such a decision could also increase the social support for enlarging the national park. Most probably, if such a decision was made by a number of large companies (including IKEA), others would follow, eventually providing a conclusive argument for enlarging the park through lack of demand for wood from the Białowieża Forest.

IKEA's cooperation with suppliers has set high standards for companies the world over. Therefore, it would also be advisable for Polish companies to follow IKEA's example. The 'low prices, but not at any price' policy introduced by IKEA has resulted not only in a better relationship with suppliers but also better living standards in the products' countries of origin. The work of auditors is therefore not only about controlling but most importantly about building a positive relationship with the suppliers and in education. However, the example of IKEA demonstrates that sustainable supply chain management shows that this is 'work in progress' that requires involvement of the company's management and continuous improvements made, especially when taking into account the company's global scope of operation and the diversity of its settings from which their suppliers come. Therefore, introduction of an analogous solution on a regional or national scale say in Poland should prove to be much easier.

Questions

1. IKEA follows similar principles in all markets in which it operates. Why does it do this?
2. In what areas, and at what scale, might activities similar to those undertaken by IKEA be performed by small and medium enterprises in your country?

Chapter 8.

Replacing products with services

8.1. Introduction

Before reading this chapter, please have a look at your DVD collection. Everyone has managed to gather quite a collection... Some collections occupy an entire shelf, some less than that. Now, looking at the individual DVDs, think about how many times each have been watched.

It turns out that in developed countries, each DVD has on average been played only once. Given that few consumers watch the same movies over and over, it seems that many DVDs have never been watched at all. There are many reasons why a movie DVD has never been played: it could have been an impulsive purchase, an unwanted gift or simply unwatched due to a lack of time. However, in all cases, the effect is exactly the same, a waste of the ecosystem services (including resources) that were required to manufacture each DVD.

The primary purpose of a DVD film is to provide entertainment, knowledge or some other aesthetic experience. This need can also be met by hiring the same movie, borrowing it from friends or even watching it on TV or at the cinema (if available). Renting the movie is a direct alternative to purchasing a DVD. This is as an example of a more efficient use of the product, and thus better use of the ecosystem services needed to produce it, because it serves the same purpose multiple times. Renting increases the intensity of the product's usage for which we can contribute to as both consumers and entrepreneurs.

The DVD example demonstrates perfectly the mechanism for increasing the efficiency of resource use (and use of other ecosystem services necessary to manufacture a product) by replacing a product with a service. However, we can also imagine a situation in which the movie rental is located far from where we want to watch the film and we need to use our car. Considering the environmental impact over the entire life cycle of a product (tool 5.T1), including the travel associated with renting, one may find that, for a small and simple product, such as a DVD, the benefits associated with re-use of a product will be offset by emissions caused by the transport needed to use it. Although on the other hand in order to purchase a DVD, the consumer must still travel.

We can appreciate the benefits of a rental even more when looking at the efficiency of the use of other products, for example hardware and tools used in the building industry. According to a number of studies conducted in several developed countries, the total average usage time of a drill ranges from 5 to 20 minutes for non-professional users. In the remaining part of its 'usage phase', the tool is left idle in the closet, garage or some other place. While we might wonder whether the external costs related to transportation outweigh the benefits associated with increased efficiency of a rented DVD, in the case of a tool as complex as a drill with its infrequent use such doubts are more easily dispelled. Tool rental is another example of products being substituted by services, thus enabling consumers to take advantage of the products without the need to own them.

Selling products is an old-fashioned business – such opinions appear both in the management and eco-design literature (see Tukker and Tischner, 2006). Companies need to focus on addressing the needs of consumers, selling a feeling of satisfaction or an experience and this is related to selling integrated solutions or product–service systems (PSS). At the same time, this approach can provide a competitive advantage

to producers in developed countries that cannot compete with the cheap products imported from developing countries.

Renting is certainly not the only form of substituting products with services. In many cases what the consumer needs is the service that a given product provides and not the product itself (for example drilling but not the drill itself). Solutions similar to those mentioned above are branded as PSS. Before looking at the PSS and its examples in greater detail, however, we need to understand the concept of an economy based on functionality which is what underpins the concepts described in this chapter.

8.2. An economy based on functionality

> Almost all of standard economic theory is in reality concerned with services. Material objects are merely vehicles which carry some of these services, and they are exchanged because of consumer preferences for the services associated with their use or because they can help to add value in the manufacturing process. Yet we persist in referring to the 'final consumption' of goods as though material objects, such as fuels, materials, and finished goods somehow disappeared into the void (…). Of course, residuals from both the production and consumption processes remain and they usually render disservices (…) rather than services. (…) The inputs to the system are fuels, foods, and raw materials which are partly converted into final goods and partly become waste residuals. Except for increases in inventory, final goods also ultimately enter the waste stream. Thus goods which are 'consumed' really only render certain services. Their material substance remains in existence and must either be reused or discharged to the ambient environment.

This is what Robert Ayres and Allen Kneese, pioneers of sustainable development, wrote about the economy in 1969. Ayres and Kneese (1969, p. 284) also quoted Frank Knight, who in 1921 wrote: '(t)he basic economic magnitude (value or utility) is a service, not good'. The notion that products are only a vehicle to satisfying needs rather than satisfying needs directly in their physical form is one of the most important concepts in industrial ecology (see section 5.3). As Ayres and Kneese stressed in 1989 (p. 90), 'the only thing consumed is their utility'.

From an economics stand point, replacing products with services leads to the use of existing products more intensively, which in effect reduces the relative amount of energy and raw materials required to satisfy a given need. While the term 'basing an economy on services' could be understood as an increase of the service sector's share in the creation of GDP, it is better to use the term 'economy based on functionality'. What is being traded in this type of economy are not products in their material form, but the functionality and utility that these products provide.[1]

The idea that this is a service of a product that we actually use is also the idea behind life cycle assessment (LCA, see tool 5.T1) and other measurement methods (for example MIPS; see section 5.2). These ideas are based on the concept of the functional unit i.e. a quantifiable measure of the utility a given product provides the utility derived from a product. Examples of functional units include: supplying a specific quantity of light to specific parameters in a given time, drying a specific number of hands or printing a given number of pages to a specific quality. These functions can be performed by a variety of products and services, each which have their own impact on the

[1] In some ways, this is similar to outsourcing – a management concept, which states that organisations should focus on their core area of activity and commission out the remaining activities (e.g. cleaning, security, accounting, and IT). Specialised subcontractors can then serve a number of companies by providing them with the same service. Thus, their work is utilised more efficiently.

environment. Thus in the literature pertaining to LCA the term 'product' has been replaced with 'product system'. This stresses the fact that a function (or service) requires more than a product which eventually provides this service and with which the consumer will interact. LCA analysts use functional units to compare the environmental impacts for providing a given service using different product systems. Also, functional thinking is used by eco-designers (tool 5.T2), who try to minimise the negative environmental impact of providing the same function.

Replacing products with services constitutes a far-reaching innovation, which enables a greatly increased efficiency in utilising ecosystem services used by society and the economy. Using the eco-innovation hierarchy developed by Nuij (2001) for example, we can classify this idea as a functional innovation (figure 8.1), that relies on a novel way of supplying the function to the user. Perfecting a product or redesigning it (which we referred to in chapter 5) does not change the way in which a function is provided to the user, but only makes the existing solution more efficient. In turn, an innovation which redesigns the whole system satisfies the needs of the consumer in a completely new way but requires changes that go beyond the means of a single company.

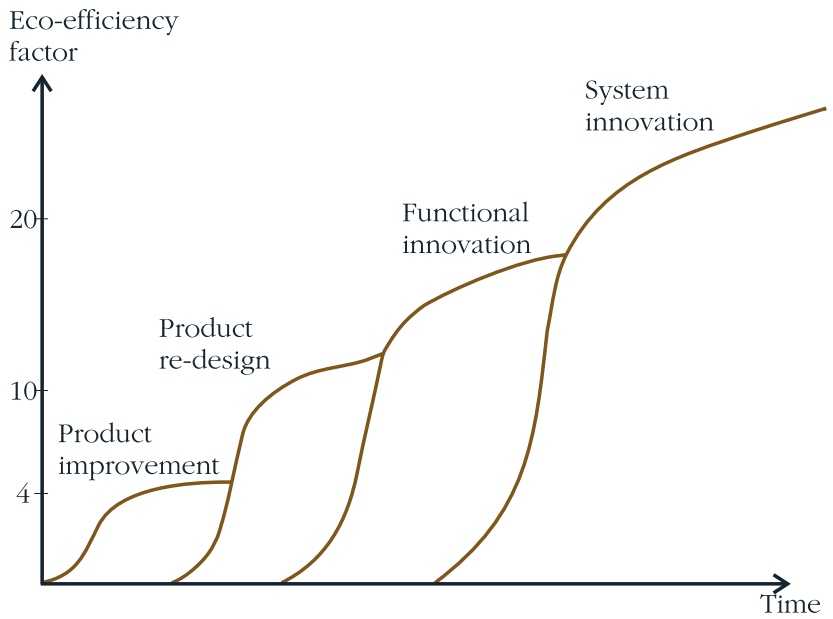


Figure 8.1. Types of innovation and the related eco-efficiency level (Nuij, 2001, p. 50)

To illustrate the different levels of innovation we can look at the small gifts that producers add to their main products to increase their attractiveness. In the case of toys supplied with meals in McDonald's or in boxes of Kellogg's cereal, an example of product improvement was provided when the companies committed not to include toys with harmful components (McDonald's on its own initiative but Kellogg had to be forced), such as batteries containing mercury (Esty and Winston, 2009, pp. 114–115). A functional innovation in this example could have been to replace toys with an intangible supplement, such as a concert ticket, or perhaps a more useful access to an internet-based educational service. A system of innovation would require the co-operation of producers and a joint decision to discontinue adding unnecessary gadgets. Indeed, Esty and Winston (2009, p. 197) described reimagining business all over again as the most advanced element of a competitive strategy.

As we saw in chapter 5, product innovation often does not solve the problem of a products' impact on the environment. In specific cases, the rebound effect cancels out part or sometimes all of the environmental benefit of an innovation. Functional innovation moves beyond these issues, and system innovation goes further still, but occurs very rarely and thus most business textbooks concentrate on the first two types of innovation (including Laszlo, 2003; Esty and Winston, 2009). However, there are books which concentrate specifically on functional and system innovations (Charter and Tischner, 2001; Halme et al., 2004; Tukker and Tischner, 2006). Interested readers will find many examples of PSS within these books which illustrate the possibilities for significant innovation. Indeed, these ideas are being followed by different companies, both small and large, the world over.

8.3. Product–service systems (PSS)

8.3.1. The concept and examples of PSS

The creation of PSS requires a holistic approach (chapter 2) that takes into account the whole system in which a given product exists. PSS is an alternative to traditional consumption models that are based on ownership, within this the consumer purchases the utility provided by products and not the products themselves. PSS provides new opportunities for producers, but they still face barriers to entry into the market.

Within the PSS approach the ownership of products is held by entities which either use the product so often that owning it is justified or by individuals who receive benefits from providing the product to other users. Regular consumers use these products only when they need the service that the product provides. This changes consumption patterns and reduces the number of unused products stored away in attics and basements. Through the centralised ownership of products, their recycling and disposal are made simpler which results in a reduction of the negative impact of resource extraction and environmental degradation. The increased use of products means that their main impact on the environment stems from their use-phase which should be the focus of eco-design. PSS requires products that are durable, manufactured to be used extensively and which are easily upgraded and repaired. Although consumers that do not own a product will typically care for it less, these products that would have been used less efficiently had they been owned may now have a shorter life-span and thus less of an environmental impact than if they had been owned and used by one person.

Some PSS have substantial social benefits, such as wider access to products, and the provision of various social functions, for example providing an opportunity for more frequent contact with other people and information. We shall look at these more closely in case study 8.C1 which describes the role of public libraries in Poland.

Mont and Plepys (2004) have analysed several potential factors that determine the viability of PSS. These include a proper legislative framework, profitability, environmental impact, consumer acceptance and utilisation of existing infrastructure (as opposed to building new infrastructure). The authors concluded that creating a PSS is the most feasible in the case of expensive, rarely used products, which require significant storage space and are costly to maintain (due to insurance, and maintenance, etc.). For example kayaks and pedaloes (water bikes) are rarely owned, primarily because they fit this description. Currently, the demand for PSS is thus reduced to a small number of products and usually this is the result of custom or habit rather than a new approach. Psychological

barriers also exist in societies that are moving away from communism and regard shared ownership with distrust.

Some producers see PSS as a threat, fearing that it will lead to a reduction of production and sales; but others see its benefits. Products that are meant to be part of a PSS have to be of higher quality and durability, which in practical terms means that they also will be more expensive, allowing producers to increase their revenue. Furthermore, providing products as service providers and maintaining them rather than selling them results in higher profits for the producer. This concept has been successfully implemented by companies such as Xerox and Coockson. In Poland, an example of this approach is provided by Wega, a company that rents out workwear. Another well-known example of this is the US-based Interface.

Xerox, in addition to selling products, also leases them out, which enables the company to collect the products at the end of their life cycle. Since 1991, Xerox has been implementing their 'more than one life' policy, which requires that all products and parts must be reused or recycled into new equipment (figure 8.2). Thanks to their close relationships with clients, Xerox has been able to reuse or recycle 91% of its waste (excluding hazardous waste; Xerox, 2008, p. 46). Similarly as in the eco-efficiency programs mentioned in section 5.2, thanks to the eco-design of products and an appropriate level of co-operation with product users, Xerox has been able to benefit from savings that have reached several hundred million dollars a year (Xerox, 2008, p. 43).

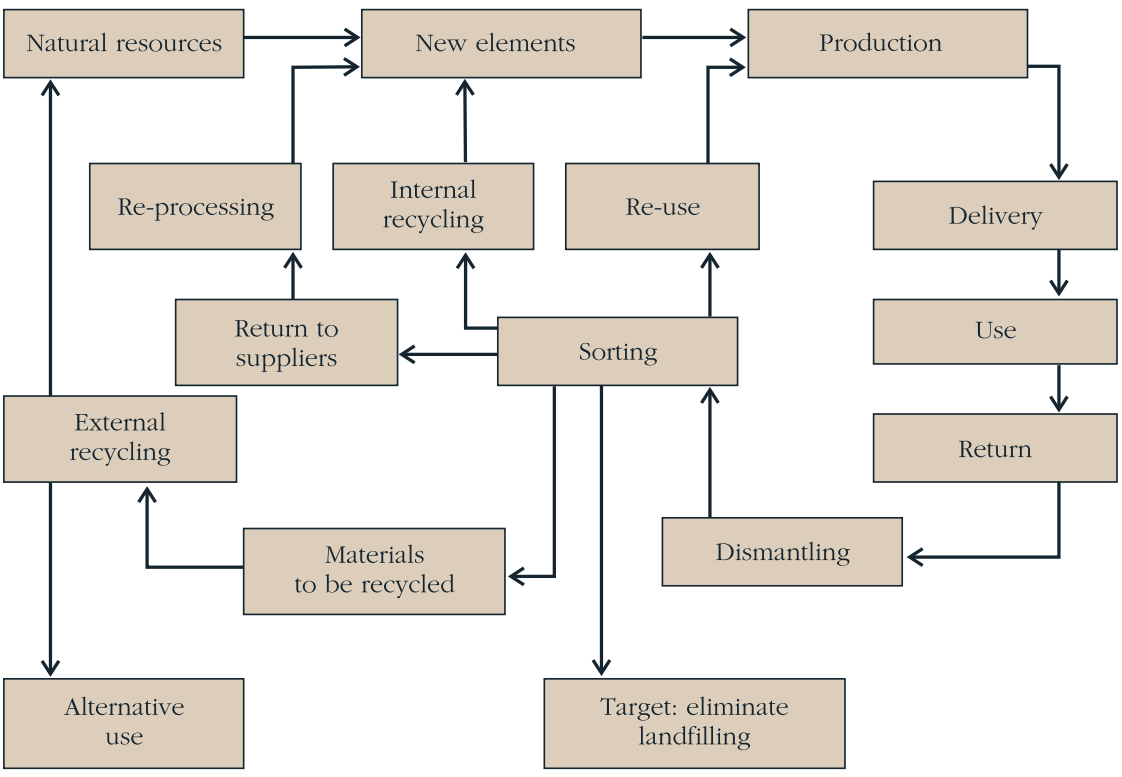


Figure 8.2. 'More than one life' of products in Xerox (adapted from Xerox, 2008, p. 43)

Wega, which has been operating in the north of Poland since 1990, provides companies with a service that supplies safety equipment and workwear. Based on the assumption that the function of the equipment it provides is the safety and dress for workers who use the product, the company is able to offer an innovative solution by supplying its clients with high quality, well-maintained equipment, without requiring its clients to actually purchase the products. The company also offers outsourcing of distribution, warehousing and management of safety equipment as well as renting and repairs for worker's uniforms. Wega retains ownership of the products used by its customers for which it charges a monthly rental fee. The uniforms are tailor-made for each individual user (including manufacture of company logos, barcodes and personalised labels), which are then delivered to the client. Personalised labels enable the same garment to be used by the same workers, as well as providing an efficient monitoring system for them. Wega also supplies wardrobes for clean and dirty attire that can also be rented.

Interface Inc., the world's largest industrial carpet producer, has within its sustainable development practices introduced the innovative product of leased carpets. The basis for this idea was the realisation that customers were not interested in owning carpets, and what they really wanted was to have something of certain desired qualities covering their floor. Thus, clients do not need to buy a new carpet if it is still possible to have the old one perform the required function. In certain markets, Interface offered their Evergreen Services Agreement (ESA), which required the company to ensure that its clients have a carpet that meets specific quality standards. Instead of paying up front, customers could pay a monthly rate. When the carpet reached the end of its life it would be collected, replaced and recycled into a new carpet within a closed life cycle. Despite the fact that ESA is still being offered to customers, the project was never scaled up due to tax and organisational reasons (see Esty and Winston, 2009, pp. 134–135).

8.3.2. Types of PSS

The most common PSS include sharing, leasing and renting, which differ from one another in terms of their ownership and maintenance structure (Kronenberg, 2007a, pp. 156–157).

In the case of sharing, the product is owned by a group of users or one of the users allows others to use his or her product (for example a shared washing machine in a multi-family house or a ladder or tool box owned by a group of neighbours). Consequently, the product amount becomes reduced but the amount of service that the products provide increases. When the purchase is made by a larger group of users, a product of higher quality can be chosen, including a product which has been designed to limit its impact on the environment, such as in terms of energy efficiency or reparability. Ultimately the higher intensity of use means that the product may deteriorate quicker and need replacing by a new, but even more efficient product. Sharing also creates new business opportunities, for example facilitating large-scale sharing, a good example of this is car pooling and car sharing (see tool 11.T2). There may even be intermediaries between drivers and passengers travelling on the same routes, charging a fee for bringing the two together. These can involve every-day commutes or one-off national or international journeys.

In the case of leasing, the producer or leasing company (lessor) retains the ownership of the product, which increases the probability that it will be reused, refurbished or recycled after its use phase. Lessors know their products better than their clients (lessees), and are responsible for their maintenance which also makes using the product more

convenient for the lessee. However, the maintenance costs are borne by the lessee within the leasing fee. Although some lessees see leasing as a cheap way of having high product turnover, others buy the product after the lease has terminated. This is called 'leakage in the ownership/responsibility loop' and results in a situation in which the items being leased are not retained by the lessor who owned them but are disseminated into the market, similar to traditional selling. Thus, if leasing is to be beneficial to the environment, the item being leased must return to the lessor, and not be sold on. In this context, Janikowski (1999, p. 176) has cited eco-leasing, in which the buy-out option would not exist.

ted with the purchase of services whereby a consumer can rent a car to utilise its transportation function and only when he or she needs to do so. Rental systems have now been developed that offer flexibility in terms of time (such as charges by the hour), formal requirements (the possibility of booking a car by phone) and place of pick-up (decentralised), the most popular provider of which is Zipcar (and the City Car Club in the United Kingdom). In a similar fashion, a consumer can use a public dry-cleaning service by effectively renting a washing machine instead of owning one. There are many other popular forms of renting for example movies, books (see case study 8.C1), tools, and sports equipment. Long-term rental is similar to leasing in that the consumer avoids buying the product while regularly using it. In the case of both short and long-term renting, the owner is responsible for the maintenance and ultimate disposal of the product which benefits the environment.

An innovative concept utilised in the IT sector is pay per use. It is relatively easy to imagine paying to use a pedalo for an hour or renting a DVD for one day, however this concept can also be used with computer hardware and software. One of the first companies to introduce this form of payment was Hewlett Packard. For its business clients, HP offers a service where the company only pays for the amount of processing power used at HP data centres (this service has been available in Poland since 2001). Thus, a company pays a varying rate depending on whether its use of HP's servers is increasing or decreasing over time. In some countries, HP offers a similar service regarding the use of printers, copiers and fax machines. In all cases, HP retains ownership of the hardware, keeping it in good working order.

8.4. Summary and conclusions

When considering the purchase of a product it is worth comparing the other ways by which we can satisfy our specific need. Using the concept of the functional unit, we can compare different product systems providing the same service, and not only in comparing different types of products. For example, different forms of transport should be considered within the same category (in terms of the functional unit of commuting 10 km to work 5 days a week) instead of treating such things as buses and cars separately. Similarly, different options for cutting grass should be compared (an electric mower, a gasoline mower, a manual mower or outsourcing) instead of solely comparing products. Narrow categories may be justified in differentiating between products the demand of which is unlikely to diminish for reasons such as personal and disposable use, for example household and personal care products.

Renting of products can be in both the short and long term. The former being closely relaFrom the perspective of a company that sells products, replacing them with services would allow the business to develop a closer relationship with its customers. Supplying services entails producing more durable, lasting and easy to maintain products that

provide more than one service as well as selling them at a higher retail price. This business model is used in the business-to-business (B2B) sector more often than in the customer facing sector. In the future however through raising consumer awareness and through influencing consumer habits this may also spread to normal customers. Perhaps this can be achieved through direct marketing (on the products themselves: i.e. 'this same need could have been satisfied via service X') or through brand value creation and through establishing long term relationships with suppliers. Revenue would come from rental fees or from servicing these products, upgrading them, and supplying parts and training. Services can also be provided through a licensed network of agencies, trained and dependent on the original company. Providing customers with satisfaction in being able to use a product without having to own it is an eco-innovative concept which can become a source of competitive advantage.

Practical resources

<www.suspronet.org> is a website of a network of experts engaged in innovative products and PSS. This site features conference materials and other resources, gathered over several years of the network's existence.

Questions

1. What functional unit can we use when comparing colour printing options and which options should we compare?
2. What social barriers are to be overcome to convince producers and consumers to sell and purchase functionality instead of physical products?
3. Why are there rental shops for theatrical costumes, wedding gowns and workwear but not for everyday clothing?
4. What should be considered when comparing the environmental impacts of an out-sourced cleaning company and hiring your own staff?
5. Give examples of products used seldom during their life. What available service could replace this product or why is such a service not being offered in this case?
6. Are there markets where products are not sold but rented only? What are these markets?
7. What environmental policy solutions could have similar effects to PSS in terms of environmental protection?
8. Give examples of systems of functional and product innovation for the following products: cars, hair driers, and books.

Case study 8.C1.
Public libraries in Poland

The most popular example of the product–service system is the library. Despite the fact that libraries in Poland are rarely privately run, we use them as a case study in the business part of the book because they illustrate well the characteristics of a PSS. A library, especially one open to the general public offers an alternative to purchasing books. In this way, we are utilising the function of books, but only when we need to. We do not need to have unread books on our shelves and these books are used more efficiently through having multiple readers. In addition to public libraries, we have specialist libraries in Poland that focus on specific types of books: such as school and university libraries, scientific libraries, pedagogy libraries, etc., directed at specific groups of users, but below we focus on public libraries.

Apart from the environmental benefits (such as more intensive use of the ecosystem services required to produce books), libraries also have important social benefits associated in terms of sustainable development. For many people libraries are a way to discover the world and they provide access to culture and up-to-date news (through access to press material). Libraries are a place where people can meet, attend events (in Poland this includes mainly exhibitions and children's shows), and often take part in nationwide initiatives such as 'All of Poland reads to kids' or book clubs. Libraries counteract exclusion and marginalisation of certain social groups, such as the unemployed, the elderly, and people addicted to TV or gaming. Polish libraries are systematically diversifying into new areas, for example by offering IT learning courses for adults.

Despite these advantages, and the expanding list of services that libraries now offer (more new books, improved technical and local infrastructure), the number of libraries is decreasing, as is the number of borrowers and rentals (PBIKiC, 2000, 2008, 2009). In 1989, there were 10,313 public libraries and local branches. In 1999, there were 9046 and in 2008 there were 8325. The number of rentals in 1989 was 155 million, in 1999,153 million, and in 2008, 123 million. These cases revealed that there had been a drop of about 20% over the past 20 years. The number of library users per 100 inhabitants had also been dropping but more slowly 1990 – 19.2; 1999 – 19; 2007 – 17.6 (a 8% drop).

Despite that more than half of library users are students (see figure 8.3) the change in the age structure of public library users in Poland shows that young people now use the library less willingly. In 2003, 66.7% of library users were under 24 years old (i.e. students), but in 2008 this group accounted for only 58.7% of readers.

To illustrate the causes for this fall in library users, we can use the results of a study conducted with a representative sample of residents from villages and small towns (FRSI, 2008a, p. 7). Among reasons for these residents not using the library, 43% said this was due to lack of time, and 22% mentioned a lack of need (nearly 60% or these respondents had not used a library within the past 12 months). However, on the other hand, 1/3 declared that they did use the library indirectly through someone else. A portion of these respondents also mentioned that they came into contact with libraries online or using the telephone, indicates that libraries also serve their users indirectly.

The causes for the decline in demand for library services include: long-term negligence in investing in library infrastructure due to cost cuts, and 'overestimation of the self-regulatory function of the free market' during the transformation period from

central planning to free markets (PBIKiC, 2008, pp. 63–66). As a result, access to libraries is limited due to short opening hours (some libraries in small towns are open for only 4 hours a day; FRSI, 2008b, p. 7) and location (residents of small towns often mention that they find it difficult to travel long distances to libraries; FRSI, 2008a, p. 6). Libraries have also experienced organisational problems when their finance and ownership structure changed, with some libraries falling under the local authority control. Changes in the demographic structure in Poland, alongside global cultural and technological change have also been important drivers of change for Polish libraries. Under such circumstances, public libraries find it difficult to compete with school and university libraries because they adapt more slowly.

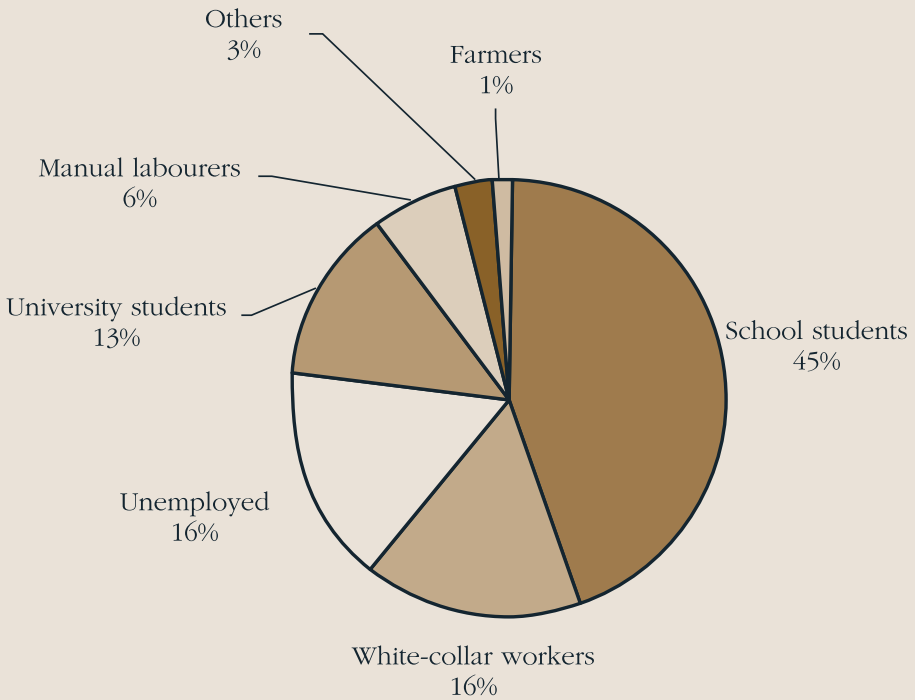


Figure 8.3. Library users by employment status 2008 (PBIKiC, 2009)

Several initiatives have been implemented to counteract the decline in demand for library services. Over the past few years a strong emphasis has been placed on modernising libraries in villages and small towns where access to libraries seemed to be most limited. In light of there not being any other cultural institutions in those areas, the role of the library was particularly significant.[3] Currently, about 40% of these facilities do not offer use of computer equipment, and the remainder usually have only an insufficient number and quality of equipment. This equipment could be used for social integration and local animation (such as through projectors and cameras) and software applications (for graphics and editing; FRSI, 2008b, p. 7), services that were particularly lacking. Modernising libraries requires more computer work-stations to be made available with workshops provided for upskilling local residents to use them. These initiatives are currently being supported through charitable initiatives by the Bill and Melinda Gates Foundation.

[3] Until the end of the 1990s, it had been estimated that between 2/3 and 3/4 of residents stopped reading books as soon as they left school' (PBIKiC, 2000, p. 34).

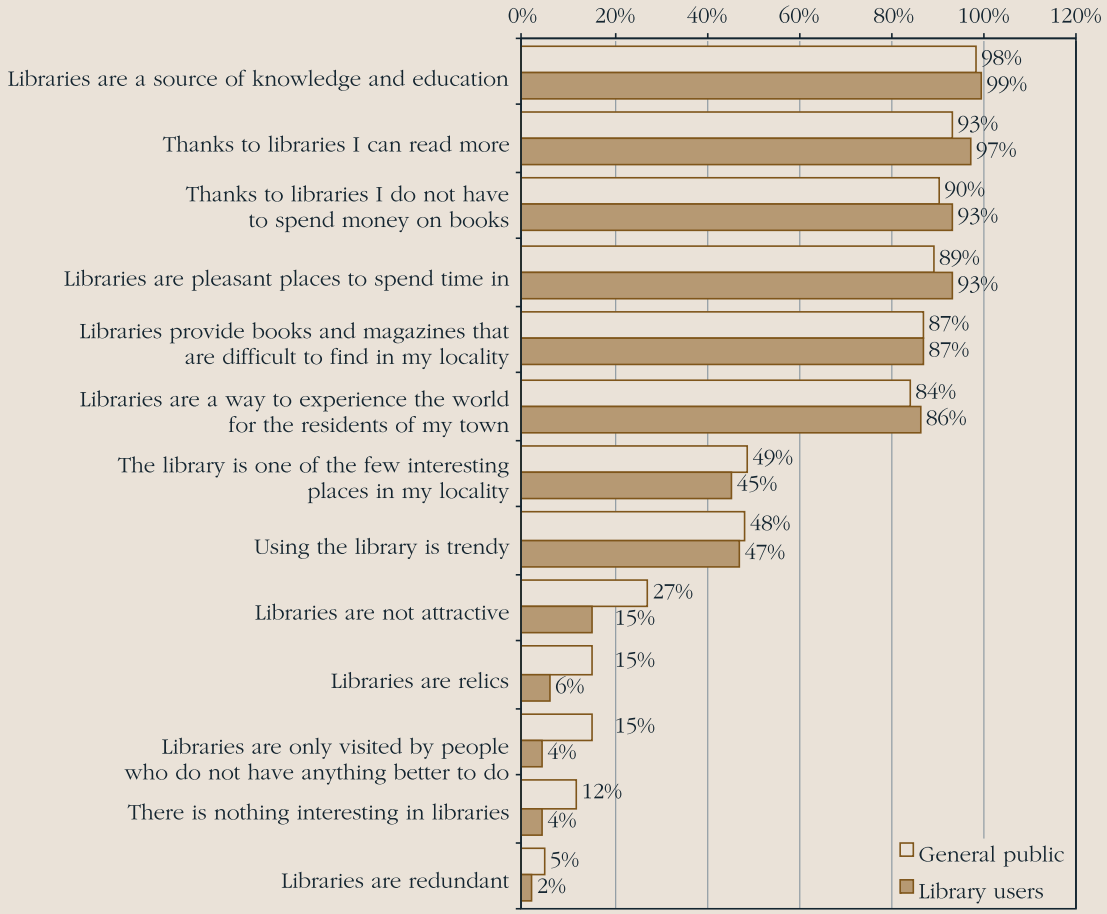


Figure 8.4. Opinions about libraries expressed by residents of small towns in Poland (2008) (FRSI, 2008, p. 66). The poll included both the general public and library users (a sample of 1021 people). The percentages show the proportion of respondents who agreed with given propositions

The fall in popularity in borrowing books from the library had been aggravated by the increased ease of accessing books in general and the increasing popularity of the internet which are interrelated. Thanks to internet-based stores, and internet auctions, the variety of books available to any given reader has substantially increased. Titles published in low quantities, once found only in local second-hand book stores are now readily available online. Furthermore, increasing numbers of people are using the internet not only as a source of information but also as a form of entertainment. Meanwhile, libraries are mainly associated with books (according to 2/3 of Poles in small towns), science, knowledge, and schooling (according to 20%). They are rarely associated with the internet (8%) or interesting events (2%) (FRSI, 2008a, p. 9; see figure 8.4). Library users are generally viewed as having a lot of free time (65%), as people who share traditional views (58%) and who are poor (40%) (FRSI, 2008a, pp. 70–71). The last statistic is particularly important in the context of a consumer society because the fact that people who use shared products are perceived as poor (and thus probably not able to afford to buy a given product) and this can be a significant barrier to developing PSS in Poland in this and in other areas.

To sum up, despite the fact that public libraries are run by the state in Poland, and not by private companies, they nevertheless serve as a good example of a PSS. They

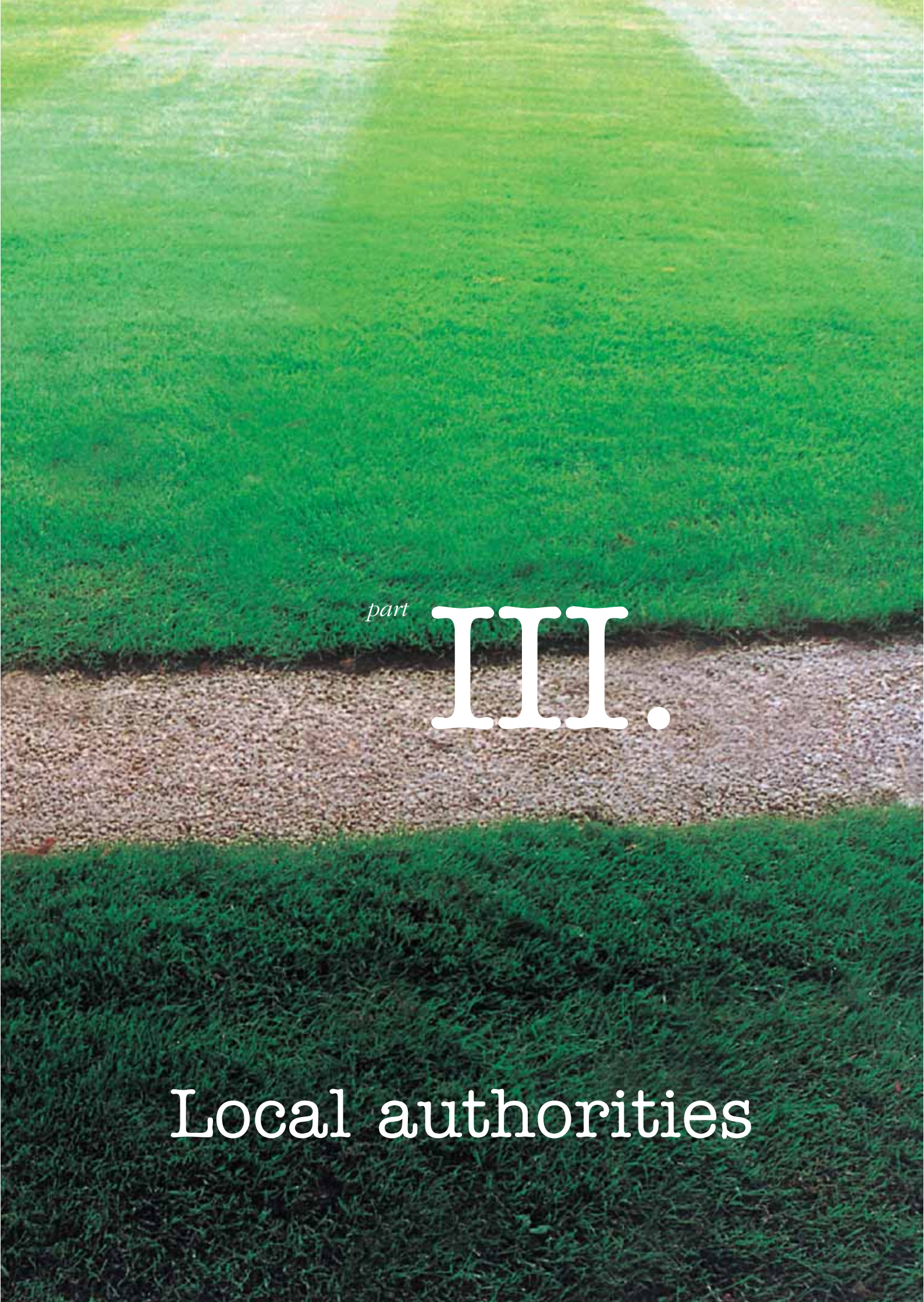
illustrate well both PSS environmental and social benefits, and demonstrate the challenges that this innovation is facing.

We began the analysis of libraries in Poland by looking at their environmental benefits, typical for PSS through increased efficiency in the use of ecosystem services embedded in the production of books. We also saw the social benefits in that libraries are a meeting place where social integration events can take place to the benefit of the local community. This feature is characteristic of many PSS, for example sharing a tool box or a car, which also facilitate meeting, talking and general social integration. In the case of libraries, as is the case with other PSS, we can see these positive externalities. Libraries provide access to culture, and technical achievements, etc. to people who otherwise might not have been able to enjoy. Libraries, like other PSS, provide an example of local development, which we shall discuss further in part III of this book.

We also looked at broader social problems and the general reluctance to borrow books in light of modern alternatives. However, libraries can be made more attractive for example by adding new functions (workshops, the internet, and events) so as to increase the attractiveness of the basic service (i.e. being able to read a book). These factors also apply to other PSS, where added value for consumers stems from a larger variety of products they could use compared to a single product they would otherwise have bought.

Questions

1. Analogous to the library example, what economic, social and environmental benefits are there in renting tools rather than owning them (both from the point of view of the consumer and a rental company)?
2. What are possible barriers to developing a PSS in Poland, and what factors could overcome them?



part

III.

Local authorities

Introduction to part III

'Think globally – act locally' is one of the best-known principles of sustainable development and this principle has become widely accepted because the local scale is both closer to home and easier to understand. Our neighbourhoods are usually the places that we care about the most and that we want to see develop. We instinctively know what will benefit our local community and what will harm it. Despite the fact that principle 'think globally – act locally' was established by the environmental movement, it is now starting to be applied to various other areas of development. Fundamentally, the foundations of sustainable development are formed at the local level, in the same ways that democracy and civic society have been.

This has also been also been observed by the authors of a 'Self-governance and local democracy' report (Imiołczyk and Regulski, 2007). They identified that the growth in self-governance and local activism are two of the most promising aspects of such social development in Poland. In this these authors saw the potential for the further development of democracy, especially in light of the current lack of trust in politicians and political parties.

NGOs also contribute to local activism: whereby one in four NGOs focus primarily on local issues, while half run campaigns on the small scale of communities or districts (CBOS, 2009). Thus, the most active members of the community, i.e. those who work in NGOs, also prefer to work on a local scale. These workers see the potential and the consequences for improving quality of life.

In recent years there has been a movement towards transferring decision making powers on environmental protection and development into the hands of local government. In effect, the environmental aspects of sustainable development are now more contingent on the efficiency and knowledge of local politicians and activists than ever because the funding available to local governments has increased significantly. Furthermore, being able to utilise European funds opens up new possibilities for local communities, but this also poses its own challenges.

Both in Poland and abroad there have been many examples of projects, some with enormous budgets, which had negative side effects that greatly surpassed the intended positive impacts. For example, the negative changes in the Tisza river valley (see case study 2.C2) or the large-scale German programme of river regulation that resulted in increasing overall flood risks and causing a series of large floods in the 1990s. These and other examples show that absence of a systems approach, disregard for the principles of sustainable development, omitting stakeholder engagement process and forgoing the knowledge and experience of local residents can result in negative outcomes (see case study 1.C3).

On the other hand, there are many local communities that do have development plans that are largely based on the principles of sustainable development. Some put these principles at the heart of their local identity, and use them to distinguish themselves from other communities. Through the use of renewable energy, environmentally-sound technologies and advanced methods of social engagement these communities are able to raise funds for further development, attract tourists and the media while developing their local economy. Spanish 'Sun-villages' are a notable example of this, where residents have generated significant revenue from the sale of electricity from photovoltaic solar panels mounted on nearly all buildings. The large dissemination of PV panels in this case also served as a tourist attraction. Another example are 'eco-villages',

which are also beginning to develop in Poland (see case study 15.C2). A notable example of these is Hostetin in the Czech Republic, where local residents have incorporated advanced environmental technologies, traditional food production methods, culture, and protection of their local heritage into social development.

However, examples such as these are rare, usually based on a unique idea by the local community, or one of their activists. Equally inspiring, and perhaps even more interesting due to their commonality are examples of societies that have successfully incorporated the principles of sustainable development into their daily lives. For example Enköping in Sweden, where for the comfort of local residents and in order to preserve environmental resources, the local government created an integrated waste management, sewage treatment and energy production facility (see subsection 12.3.2). This enabled this small town to achieve energy independence, which was significant in light of rising energy prices. Thus, solutions such as these are not only environmentally friendly but also help solve many issues related to waste and sewage management.

There are also a number of these types of initiatives in Poland. The bicycle project in Gdańsk is a prime example which consisted of building more than 10 km of bicycle paths and slowing down traffic on existing roads. Apart from the obvious improvements for cyclists it also reduced greenhouse gas emissions, improved road safety and increased general mobility for the city's residents. There are other, equally interesting examples of local initiatives found throughout this book, for example projects in the Barycz valley (case study 2.C1), refurbishment of the Turzyn Neighbourhood in Szczecin (6.C1) and the Siewierz eco-town (10.C2).

The value of developing locally, leads to close working between local authorities and the community (Bergier et al., 2009; Damurski et al., 2007) through support for their sustainable development efforts. It is in local governmental institutions where we particularly see, in addition to the private sector, the largest potential for practical implementation of sustainable development principles. This book reflects this approach, especially in part III and subsequently informs the debate with regards to local government employees, activists, NGOs promoting local sustainable development, and the building of self-sufficient and self-governing societies. Most of the chapters in this part of the book are similar in structure and describe the general challenges on certain issues, presenting a number of varied solutions and examples.

The part relating to local governments consists of five chapters, addressing issues in both urban and rural communities and districts. Chapter 9 describes local development strategies with universal application. The tools presented (especially Local Agenda 21) are particularly focused on engaging all stakeholders in local communities in the decision making process to build a more coherent vision of development.

Chapter 10 deals with sustainable urban planning and chapter 11 deals with transport solutions for cities. These problems relate particularly to cities but can easily be transferred to a rural context, especially urban planning with its close links to land use planning.

Chapter 12 is dedicated to municipal management relating to both urban and rural communes and evaluates aspects of sewage and waste management. Some of the solutions outlined (for example home sewage treatment plants) are more applicable in areas where buildings are scattered far apart, primarily due to the significant difficulties of building sewage systems in sparsely populated rural areas. Interestingly (especially for local government), studies have shown that municipal management is a key driver for not only environmental protection, but also for supporting local activism.

Closing the discussion on local initiatives, chapter 13 describes public-private partnerships, which again can be applied in both urban and rural areas. These partnerships can be implemented to improve the local economy and raise the quality of public services. We focus on how this form of joint-venture can be used to aid sustainable development and highlight that partnerships between the public and private sector have an important role in facilitating the cooperation between local authorities and residents.

In the preface to this book we noted that sustainable development concerns all areas of our lives, and all of its aspects are closely interrelated. For this reason the allocation of chapters into specific parts is arbitrary, and contents relating to local development can be found in all of the parts. This is evident in chapter 15, and in case study 15.C2 on thematic villages, which describes how combining implementation of local government projects with social activism is possible. As we note many times in part III, social engagement is essential for sustainable development (tool 1.T3). A mechanism with much untapped potential is green public procurement (tool 7.T2), still uncommon in Poland. Other chapters are particularly important for those whose work involves local decision making, including chapter 2 (systems thinking) and chapter 6 (construction and architecture).

With the rise in significance and activity of local governments in Poland there are many initiatives and projects under development, all of which could not fit into this book. Other opportunities for local authorities and communities also include:

- EU funding, for example through the fourth priority axis of the Development Program of Rural Areas Operational Programme (previously called LEADER), directed at creating local activity groups, supporting their autonomy and stability;
- numerous workshops focusing on creating and supporting local partnerships for social and economic development directed at local government employees, the private sector and NGOs; and
- Schools for Eco-development programme, run by the Polish Environmental Partnership Foundation in Krakow.

Alongside these are many other programmes and initiatives run by local governments, governmental institutions, foundations and other NGOs, which are too numerous to cover here.

Chapter 9.

Sustainable development strategies and indicators

9.1. Introduction: sustainable development as a strategic objective

Practical implementation of the concepts of sustainable development and the necessity to face the challenges of the 21st century call for a new philosophy on development at local, regional and global scales, as opposed to the narrow paradigm of economic growth. Sustainable development requires integrating the economic, environmental, spatial planning, and social (including political and institutional) dimensions.

A basic tool for building of a new paradigm of social awareness, based on a wise use of natural resources is strategic planning (such as development strategies) created and realised on the basis of partnership between various sectors.[1] The main reason for introducing a new generation of plans is to ensure a higher quality of life through sustainable development. Sustainable development then is the main strategic objective, the achievement of which should favour maintaining a balance between the different factors of life (such as welfare, well-being and happiness),[2] both in individual and collective terms (Borys, 2005; Borys and Rogala, 2008).

Taking into account that sustainable development is a strategic objective of various planning documents (strategies, programmes, policies, etc.), elaborated at local, regional and global level, highlights the importance of this concept. This recognition serves diagnostic and planning purposes in understanding the state of sustainability, defining and updating development objectives, alongside monitoring their implementation. This is grounded in the other important criteria for sustainable development, including:

- legal regulations (for example, Article 5 of the Polish Constitution, and other legal acts, such as the Environmental Protection Law of the 27th of April 2001 and the Spatial Planning Law of the 27th of March 2003);
- systems of value that represented the different areas (economic, social, environmental, and spatial) alongside the rules that govern them; and
- the indicators that measure the condition, progress, and resources, i.e. a well-structured and well-defined set of indicators that monitor the implementation of sustainability.

Seeking to achieve sustainable development, local authorities are moving towards certain positive states to realise certain objectives. In planning practice, the strategic objective of sustainable development is divided into a set of overall, leading and specific objectives (figure 9.1).

The overall objective is the most general one, in other words, it is the basic idea of future development. In a very simple, general way, it expresses an idea of a previously defined vision for an area subject to planning. This objective is usually achievable and quite possible when we undertake certain strategic actions. For a particular strategy, only one overall objective is defined, for example a higher quality of life for an area's inhabitants: region, district (powiat) or community (gmina). However, in planning practice, it is sometimes very difficult to distinguish between the overall objective and

[1] These documents refer to the analogous elements of a sustainability management system in business, which we studied in chapter 4.
[2] Welfare refers to the material sphere, and well-being to the emotional and mental spheres, while happiness refers to the spiritual sphere and that of feelings. Altogether, these three concepts represent the holistic idea of quality of life.

the leading objectives, although these two objectives differ in their attainability and scope in their achievement.

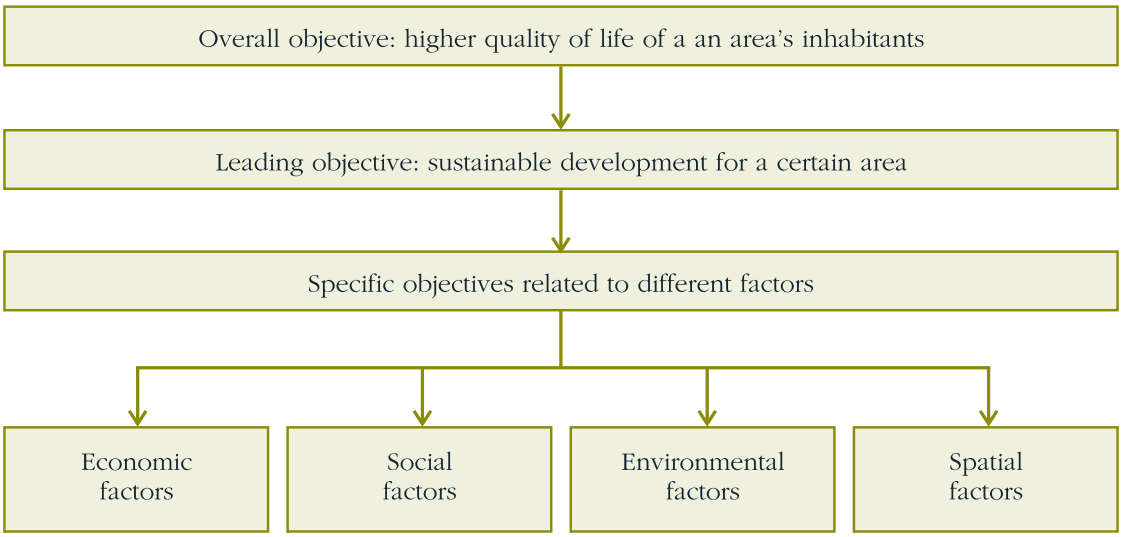


Figure 9.1. The structure of objectives in sustainable development planning (Borys, 1998)

A leading objective, as opposed to an overall objective, should be achievable and for this we are entirely responsible. In defining a leading objective we need to decide what kind of development will ensure achievement of the overall one. When building a sustainable development strategy, fundamentally what is being sought is: social and economic development in harmony with the environment, and development that ensures the intergenerational equity (see chapter 3). When preparing sustainable development plans, a leading objective is usually defined by the name of the programme (for example a strategy of sustainable development for a community). In this case, sustainable development is a means of implementing the overall objective, based on a respect for natural resources and a high quality of life.

Should we define one or more leading objectives? In practice, a leading objective is often broken down into several objectives according to the economic, social, environmental and spatial dimensions. An important, but very rarely defined objective is also good governance, and political and institutional order.

Another important area of work in local planning is the defining of specific objectives. In the definition of a vision, such that the overall or leading objectives are expressions of a community's will for the future, specific objectives are established as very precise targets for achievement. They arise through two forms of analysis:

- analysis of the situation, consisting of:
  - analysis of institutions and stakeholders;[3]
  - and analysis of the area under consideration, its strengths, weaknesses, opportunities and threats (aka SWOT analysis);

[3] Stakeholders analysis is an analysis of potential supporters and opponents to a sustainable development strategy. It concentrates on two basic questions: 'who are the stakeholders?' (institutions and decision makers) and 'how important are they from the point of view of a community?' (or some other level of authority). From this emerges a third question: 'what activities can we undertake to ensure the maximum possible cooperation of stakeholders?'. Through this analysis we divide stakeholders into: those with a positive attitude (support), and those with a negative attitude. Those responsible for this analysis elaborate how support can be increased from stakeholders with positive attitudes whilst diminishing the negative attitudes of the others. See also stakeholder analysis and dialogue as part of a sustainability management system of a company in section 4.8.

– analysis of problems that appear in a given area, to obtain a true picture of the actual state of the area, showing mainly the obstacles and negative elements in a current situation and interactions between the elements that might halt the leading objective of sustainability.

Specific objectives reflect certain external conditions, as well as the internal possibilities for each local authority and these can be driven by the transformation of problems into object solutions. Each of the problems (i.e. negative aspects) are transformed into an object solution (i.e. a positive aspect), to be aimed for in the future. We present here two examples of specific objectives that are largely typical of local strategies:

– 'a high ecological awareness of community inhabitants' (as a positive effect in changing the problem: 'insufficient ecological awareness of community inhabitants'); and
– 'a community has a complete system of waste management' (as a positive effect of changing the problem: 'community does not have a complete system of waste management').

As in all other cases, the basic rule for defining specific objectives is to stick to what is known. If objectives are not defined clearly enough, they will be very difficult to achieve and it will be also difficult and complicated to estimate progress. Besides adhering to these features in defining objectives correctly, we have to remember the following:

– objectives are not actions (i.e. processes), but pictures (of states) of future situations; and
– objectives need to be defined at the same level, and not in a cause–effect framework.

To illustrate how mistakes can be made in this regard, we offer the following theoretical objective: 'aiming to decrease air pollution by limiting the use of cars'. In such a statement we can see an action (i.e. a process) that may serve to achieve an objective, and a cause–effect chain. But if we wanted to do this correctly, we should focus on parameters for lowering emissions or air quality.

9.2. Strategic documents

Planning and managing of sustainable development (in its economic, social, environmental and spatial dimensions) is the fundamental purpose of local and regional authorities. Indeed, planning and management are closely related. To be effective, planning and managing development has to be integrated and coherent at all levels and areas. Certainly, this is only a proposition that can be realised by the use of varying governance approaches to sustainability in practice. However, practice has highlighted that the achievement of this integrity and cohesion is increasingly difficult, because the number of plans at every level of local government is constantly increasing. For example, at the level of a designated community, there are more than ten different types of local development plans that have to be prepared. The most important are shown in figure 9.2.

The system of managing implementation of sustainable development strategy is a very important and an often underestimated part of the process that will decide its dynamics. If we do not establish such system, the strategy and the related documents will soon become irrelevant. Such a system is primarily created by instruments of strategy implementation and by subsystems of monitoring (i.e. observation of the given objectives' implementation) and strategy updating (Borys, 2003, pp. 250–279).

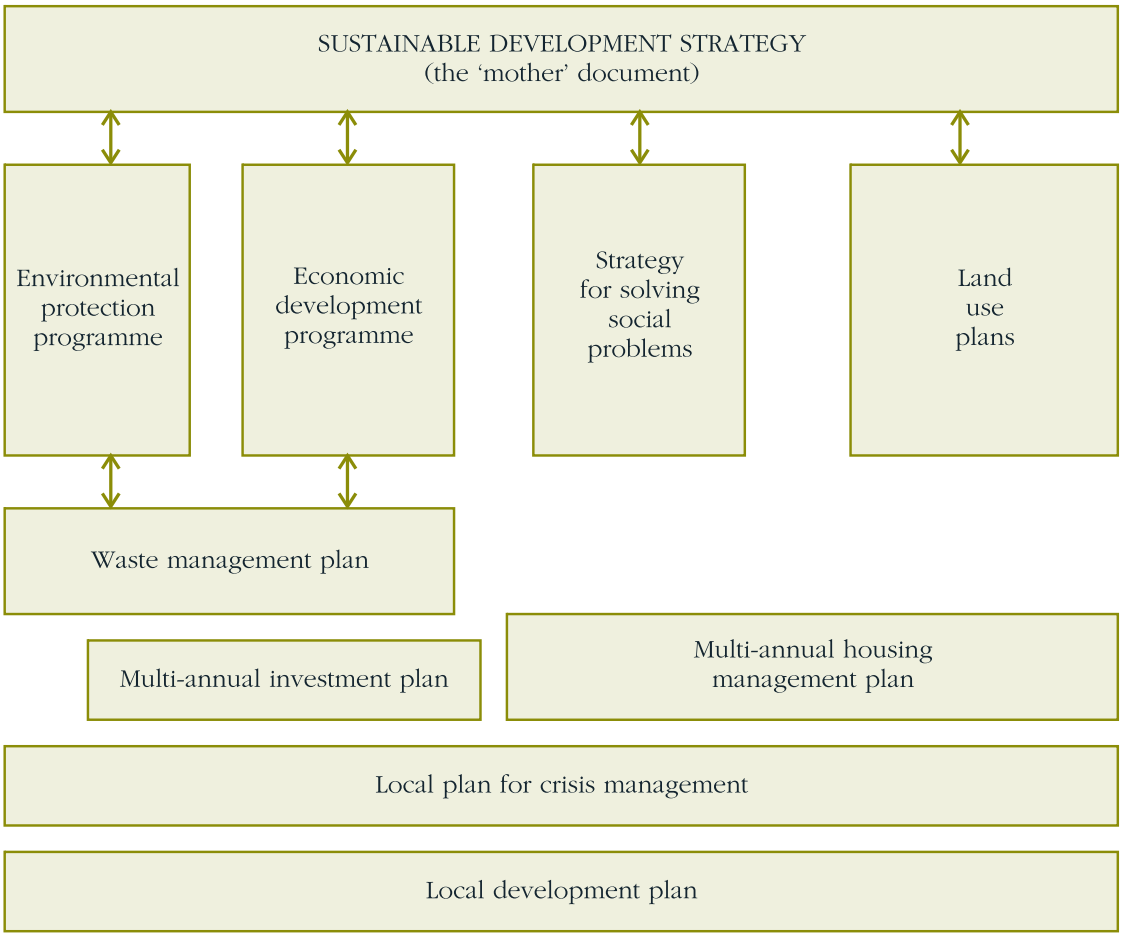


Figure 9.2. Most important documents for local development

9.3. Integration of the measurement of sustainable development and quality of life

An inability to measure and monitor everything that is happening in a project, as well as the high expenses related to the complex measurements have necessitated the use of specially prepared lists of sustainable development indicators. These indicators must be defined the moment the strategy is prepared and not delayed till the implementation stage. These indicators are established to answer the questions on 'what is the current state?' and 'how can the progress and impacts of sustainable development be measured?'.

The aim of indicators is to provide a true picture of the state of implementation of objectives adopted in a sustainable development strategy. These indicators should:

- facilitate local authorities and residents to estimate implementation levels of sustainability;
- visualise the pace of implementation of the plan against existing problems;
- stimulate higher activity for taking action on sustainable development; and
- verify binding policy directions, and already adopted development objectives and strategies to achieve these objectives.

A particular list of indicators will always be a compromise between the universal concept of sustainable development and the specificity of a city, community or region. It relies on the local or regional community in choosing the important issues to be

monitored. Although various lists of indicators may differ, their main indicators are usually the same which raises the possibility of comparison between regions or other spatial units (such as the community or district).

Tailoring the surveillance of a strategy's implementation to its structure necessitates connecting sustainability measures to measures of quality of life. This is currently the biggest challenge that is faced by indicator-based monitoring. In Poland, there are already two systems of indicator-based monitoring that do bind the measures of development to those of quality of life. The first system functions within the framework of the European Urban Audit programme; and the second is the Self-government Analysis System (SAS) that has been developed by the Association of Polish Cities (Związek Miast Polskich).

The evaluation of the quality of life and sustainable development within the framework of the Urban Audit is based on objective and comparable data and covers 258 of the largest EU cities. This research uses over 336 variables, on the basis of which over 280 indicators have been estimated (table 9.1). In this case, the analysis of indicators is connected to the assessment of subjective quality of life in the cities (via answers given to 23 questions during telephone interviews). Twenty-three Polish cities participated in the programme (including all the provincial capitals); the programme has been coordinated by the Statistical Office in Poznań.

Table 9.1. The structure of Urban Audit programme (with the number of indicators in each sub-domain given in brackets)

Domains	**Sub-domains**
1. Demography	1.1. Population (27) 1.2. Nationality (4) 1.3. Households' structure (12)
2. Social aspects	2.1. Housing (19) 2.2. Health (22) 2.3. Crime (3)
3. Economic aspects	3.1. Jobs (48) 3.2. Economic activity (21) 3.3. Income disparity and poverty (8)
4. Active participation/citizenship	4.1. Social activity (14) 4.2. Local administration (12)
5. Education and schooling	5.1. Accessibility of education (15) 5.2. Educational structure of population (12)
6. Environment	6.1. Climate/geography (5) 6.2. Air quality and noise (13) 6.3. Water (7) 6.4. Waste treatment (6) 6.5. Land use (19) 6.6. Energy use (8)
7. Travelling and transport	7.1. Travelling standards (23)
8. Information society	8.1. Users and infrastructure (9) 8.2. Local e-administration (4) 8.3. ITC sector (6)
9. Culture and leisure	9.1. Culture and leisure (12) 9.2. Tourism (6)

The Self-government Analysis System (SAS) <www.sas.zmp.poznan.pl> has been in operation since 2007. In addition to a quality of public services survey, the SAS has been broadened in scope with two additional modules of indicators on: sustainable development and quality of life of residents. The sustainable development indicators' module offers the measurement of synthetic approaches for various domains and factors (the economic, social, environmental and spatial). Within this module, four levels of sustainable development analysis are possible, all of them adjusted to the need to monitor implementation of local strategies (see figure 9.3). The system offers a query on quality of life, together with survey methods and report structure. The sustainable development module includes over 250 indicators that make use of the database of the Regional Data Bank of the Central Statistical Office (GUS). Table 9.2 presents the structure of the indicators in the SAS sustainable development module.

Table 9.2. The structure of sustainable development SAS indicators' model

Social order	**Economic order**	**Spatial and environmental order**
Social dimension domains	Economic dimension domains	Spatial and environmental dimension domains
Demographics Education (including schooling) Social assistance Health Public security Housing Culture, sport and leisure (lifestyle) Social participation Job market Political and institutional factors	Community's finance (budget; revenues and expenditures; covenants, debts, use of EU funds) Entrepreneurship (entities and employees) Entities' structure Level and structure of employment Housing Tourism Agriculture Infrastructure Use of resources and materials (including industrial waste and its management) Accessibility of products and services	Environmental issues in spatial planning Landscape and nature protection Protection and sustainable development of forests Soil protection and waste treatment management Natural resource management Water protection, surface and underground (resources, quality, pollution, use, flood protection) Air protection (quality, emission, climate protection) Noise protection (quality, emission, noise) Renewable energy (use) Biological, chemical and electromagnetic security, industrial accidents prevention

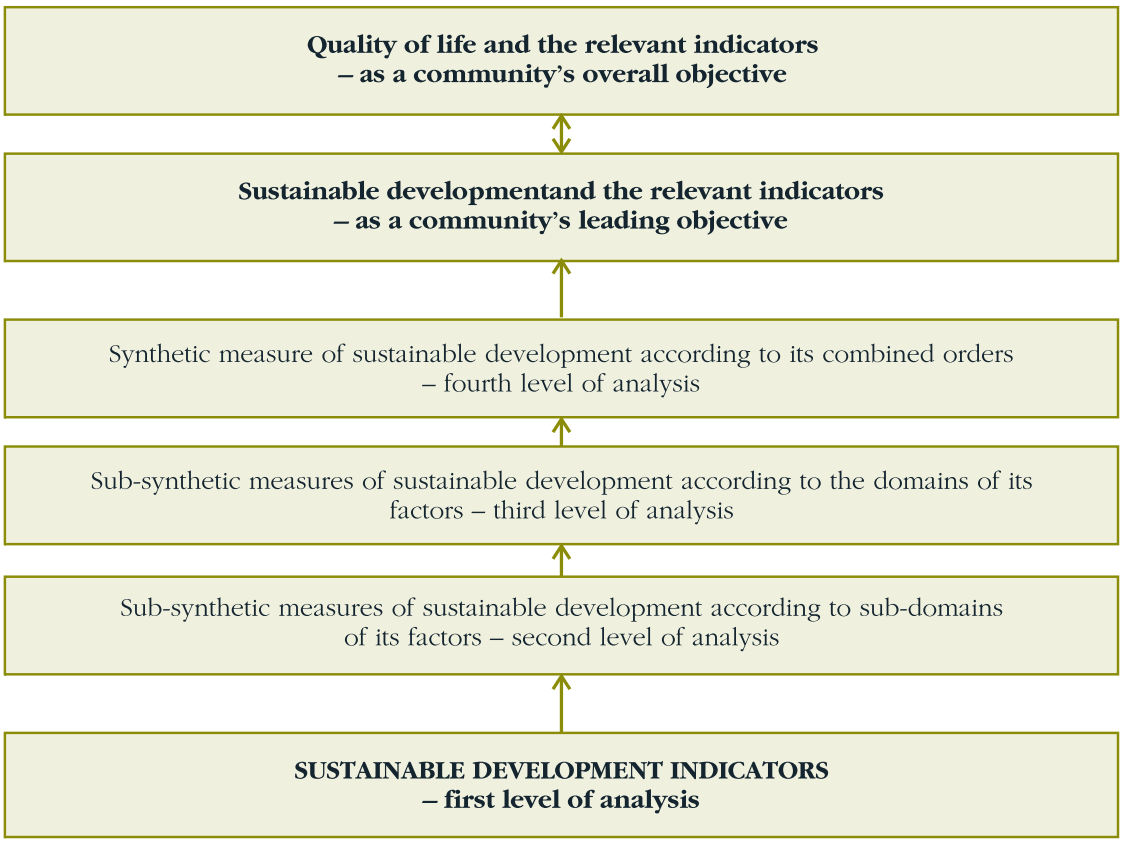


Figure 9.3. The levels of indicator-based analysis of sustainable development in a community

As the Urban Audit and SAS have shown, the Polish local authorities are well equipped with a system of monitoring for sustainable development strategy implementation. These systems comply with the following features of good monitoring:

- reliable and objective with well-defined objects for measurement (of sustainable development);
- adequate to user's needs and applicable for planning, diagnosing and taking strategic decisions at the local level, and importantly connected to sustainable development;
- comprehensible for the user;
- current as well as with a necessary retrospective (longer time series were available for observation of the direction of change);
- consistent through regular use of standard indicators but with very careful changes by adding or reducing the indicators as required; and
- based on a stable and easily accessible database of public statistics (available online).

These indicators could be used for planning sustainable development, most often pursued through Local Agenda 21 (see LA-21; case study 9.C1), and can form a basis for the evaluation and review of a plan (LA-21 audit, tool 9.T1).

Tool 9.T1.
Local Agenda 21 audit

With increased numbers of local sustainable development strategies being adopted by Polish local governments, it has been important to verify the following:

– whether existing strategies comply with requirements for sustainable development strategies; and
– what the state of sustainability is before and after preparing a strategy and its implementation.

Answers to these questions can be found through the use of LA-21 audit (see Rogala, 2003). The audit is an instrument that is applicable to many domains, such as finance, quality control, environment, ethics, and marketing (see suppliers' audit described as tool 7.T1). In Poland, the use of this instrument for sustainability management locally began in 2002 since being promoted by the UNDP Umbrella Project which also supported local authorities in Poland in creating sustainability strategies.

The audit, as experience has shown, enables the putting in place the monitoring of sustainable development implementation. The audit can be external or internal (performed by local authority officers). Typical audit procedure, applied in UNDP programmes, consists of four stages, as shown in figure 9.4.

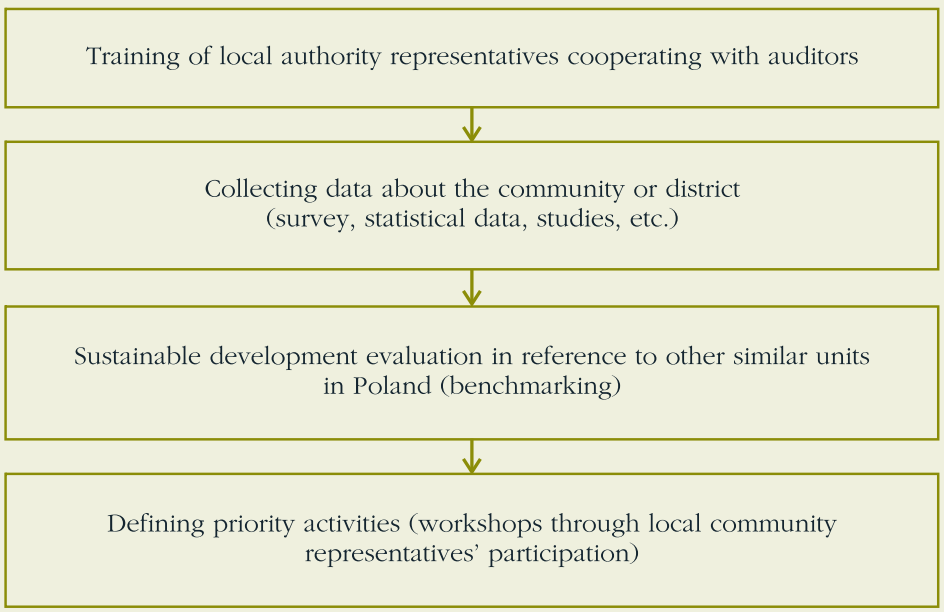


Figure 9.4. LA-21 audit procedure (Borys, 2003)

In an audit, the following elements should be assessed:

– strategic plans (i.e. sustainable development strategies) – whether they:
  – fulfil the basic criteria, in theory and in good practice for management (the structure of the strategy, and its clarity, etc.);
  – incorporate all the principles of sustainable development; and
– level of development, judged on the basis of:
  – the value of sustainability indicators, concerning the economy, society, environment and local government management;
  – comparison with other indicators estimated for other, similar local government units.

The typical structure of the report from a sustainable development audit according to UNDP standards is shown in table 9.3.

Table 9.3. Structure of sustainable development audit report

Part I. Diagnosis	
1.	INTRODUCTORY INFORMATION 1.1. Basic concept, including sustainable development principles 1.2. Information about the audit and its procedure 1.3. Synthetic characteristics of the community
2.	CHARACTERISTICS OF STRATEGIC DOCUMENTS 2.1. Evaluation of the community's strategy with respect to sustainable development principles 2.2. Evaluation of the community's documents in their compatibility
3.	STAGES OF SUSTAINABLE DEVELOPMENT STRATEGY IMPLEMENTATION 3.1. Subject implementing the strategy 3.2. Implementation of the strategic activities
4.	ANALYSIS OF INDICATORS 4.1. Long list 4.2. Short list 4.3. Analysis of indicators in the pressure–state–reaction framework
5.	SUMMARY – diagnostic analysis
Part II. Evaluation and direction of development	
1.	Comparative analysis of indicators
2.	Evaluation of the community's sustainable development
3.	Suggestions for the direction of development, including good practice in sustainability

The specificity of a sustainable development audit makes this tool applicable to also solve other problems that local government authorities need to face. The following examples demonstrate the applicability of the audit in building:

– a system for coordination and facilitation of actions in City Council of Warsaw; and
– the Inter-sectoral Partnerships of Płock and Wałbrzych.

A sustainable development audit is a very practical and useful tool for observing the progress of LA-21; it is a form of monitoring, regarded as the most important informative instrument for strategy implementation. An audit combines two complementary forms of monitoring:

– the social, which means the participation of the local community, through public opinion surveys (questionnaires and opinion polls), propagating information among residents on the progress and impacts of the strategy implementation and all changes made to the strategy communicated through various media (such as TV, radio, public meetings involving the authorities and local communities); and
– based on the use of indicators, a quantitative picture on the scale of the strategy's implementation of objectives.

The audit of the sustainable development strategy helps improve the quality of the strategy through the introduction of all necessary changes to the original document, resulting from new laws, and

changing economic, social and political conditions.

The necessity of updating the strategy results from continuity of planning and a long-term perspective. This requires continuous monitoring of changes and their introduction into the document and extending the horizon for planning (to the years that follow). The system of updating differs for the part of the document that includes the vision for development and the strategy's objectives (which is a tactical update done every 4 years) and for programme part (operational updates, from year to year).

Between 2002 and 2007, a sustainable development audit was conducted in many Polish local authorities. In a framework that was translating the Polish experience to other countries sustainable development audits were conducted in 10 local governments in Lithuania and 10 local governments in Ukraine. The audit is thus a well-examined tool which can support the use of sustainable development indicators functioning within the SAS framework (Self-government Analysis System).

9.4. Summary and conclusions

The practical implementation of sustainable development concepts and the necessity of facing the challenges of the 21st century require a new paradigm for global, regional and local development. This new paradigm has to challenge the narrow focus of economic growth and focus on the integration of economic, environmental, spatial, and social (political and institutional) factors. The premise for introducing a new generation of plans is to ensure the higher quality of life that sustainable development may bring.

Recognising that sustainable development must be the strategic objective for the various types of planning (strategies, programmes, and policies) drafted at local, regional and national levels is essential for sustainability. In planning practice, the idea of sustainable development is introduced through three levels of objectives: overall, leading and specific. Without this structure of objectives, the idea of sustainable development is only a slogan that is not reflected in real actions of local authorities.

As in business, in a local authority the system of managing a sustainable development strategy's implementation is a very important part of the strategy itself, although often underestimated. If the system lacks one, the strategy will be meaningless. However, it is impossible to measure and monitor everything and the expense imposed by the using of a specific list of sustainability indicators is high. Moreover, the measurement of sustainable development needs to be attached to a quality of life measurement, and this is the biggest challenge that indicator-based monitoring now faces. In Poland, there are already two indicator-based systems in the monitoring of sustainable development and quality of life.

In Poland, the UNDP Umbrella Project elaborated the standard for strategic planning at the local level that considered the strategic importance of sustainable development, combined with quality of life was an overall objective (case study 9.C2). Over the last few years, this standard has been improved and enriched with a new system of indicator-based monitoring that is strictly incorporated into the structure of the sustainable development audit (as its basic diagnostic tool). These standards verify to what extent the planned development objectives are being met in practice following the principles of sustainable development.

A leading role of inter-sectoral partnership (planning and supervising implementation of sustainable development) in the standards is to provide the required conditions

for drafting and implementing sustainable development plans in accordance with Local Agenda 21. Social participation is also a very important part of managing the key issues associated with sustainable development, and these we shall assess in the chapters that follow.

Practical resources

Borys, T., Rogala, P. (eds) (2008), *Quality of life on local level. An indicators-based study*, Warsaw: UNDP.

UNDP (2003), *Poland towards sustainable human development*, Warsaw: UNDP.

<www.urbanaudit.org> this website provides information about the cities participating in the Urban Audit programme, and features an opportunity to rank these cities according to their particular features. Thanks to the use of common indicators, we can compare information on different cities. Statistical data gathered within the Urban Audit programme are also available through Eurostat database.

<www.ec.europa.eu/regional_policy/themes/urban/audit> current information about the Urban Audit programme and audit results for 258 cities.

Questions

1. What role is played by diagnosis and planning in the implementation of sustainable development?
2. How can we connect different dimensions of sustainable development with the structure of objectives used in local planning?
3. What are the relationships between sustainable social and economic development and quality of life?
4. What opportunities are there to ensure an objective procedure for setting local goals in sustainable development?
5. What types of strategic and operational plans are created in your community? Do they refer to sustainable development?
6. What emphasis do the authorities in your community attach to the system used to implement a sustainable development strategy? What is this system's structure?
7. What tools are used in monitoring the implementation of a sustainable development strategy?
8. Which specifics need to be taken into account for a community, a district, and a municipality in an indicator-based monitoring of its sustainability?

Case study 9.C1.
Local Agenda 21 in Poland

The basic tool for the implementation of sustainable development concepts at the local level for planning and implementing activities, is Local Agenda 21 (LA-21).[4] As the experience of the Polish local authorities has shown, actions taken within the Agenda have created a dynamic social process for sustainable development implementation, based on a partnership in which local communities actively participate in taking key decisions. LA-21 is a very important tool for building a civic society characterised by respect for natural resources.

In practice, this means creating a local strategy for sustainable development within a social process that integrates environmental protection policy with economic, social and spatial planning. Preparing strategic documents and implementation of the documents without such inter-sectoral partnership cannot be in accordance with Agenda 21. LA-21 is also a process for the following:

- creating a comprehensive strategy, based on sustainable development concepts;
- building local authorities' capacity for partnership; and
- establishing a solid base for social communication in the process of creation, verification and implementation of the local development plan.

In the early 1990s, only 5% of the authorities in Polish communities had the knowledge of Agenda 21. However, a survey with a large sample of communities (totalling 1023 questionnaires sent to communities in southern Poland, with 23% returned), conducted between 1999 and 2000 by the Polish Ecological Club, revealed that the situation had improved, although in most communities (70%) the ideas included in LA-21 and the concepts of sustainable development remained unknown. Furthermore, this level of awareness is similar today. The implementation of sustainable development concepts through LA-21 in Polish local authorities has been extremely variable, depending on the way the Agenda is understood, which enables us to determine three levels of progress in LA-21 implementation within Polish local authorities.

1. The 'cow-boy' level, characterised by a lack of knowledge of Agenda 21 and rejection of sustainable development concepts, regarding the environment as a barrier to economic development, a lack of socialisation in local planning, a predominance of 'end-of-pipe' solutions to environmental problems, underestimating low environmental awareness, and a predominance of an egocentric approach towards development.
2. The limiting of Agenda 21 to environmental protection issues only where LA-21 is treated as a programme for environmental protection, only as a part of local environmental or spatial planning policy. This level can be called 'small' Agenda 21. Pilot projects for creating such an LA-21, implemented at the end of the twentieth century, were an important inspiration for establishing standards for

[4] The United Nations Conference on Environment and Development in 1992 in Rio de Janeiro made the concept of sustainable development more precise, through the Rio Declaration (with its 27 principles) and a comprehensive plan of action – Agenda 21. The role and activities of local authorities and communities in sustainable development implementation are defined in chapter 28 of Agenda 21, that states: 'many of the problems and solutions being addressed by Agenda 21 have their roots in local activities, the participation and cooperation of local authorities will be a determining factor in fulfilling its objectives. (…) Each local authority should enter into a dialogue with its citizens, local organisations and private enterprises and adopt "a local Agenda 21".' It is clearly underlined that socialising the process of decision making, independence and initiative of local authorities is highly advisable. Agenda 21 emphasises the roles that local communities and other local actors (local authorities, NGOs, business and local leaders) play in developing local economic and social infrastructure, spatial planning, protecting the local environment, creating their own visions of development and participating in local, regional and national development vision implementation.

creating sustainable development strategies in Polish local authorities. Their aim was particularly to support the local authorities' capacity to develop participation and communication within society while creating and implementing a local vision of sustainable development. Two cities, Radom and Ełk, were chosen as pilot cities for testing implementation and adjustments to Polish conditions of an idea for a local programme of activities for the environment. Whilst the social advantages of building a 'small' Agenda are without question, their limited scope was inadequate. Since 2000, the practice of creating such Agendas has gradually diminished, because of among other things the legal obligation to have a local environmental protection plan. Currently, almost all communities have established similar plans, but not calling them LA-21 or sometimes not even referring to Agenda 21 itself.

3. The level of systemic inclusion for sustainable development and Agenda 21 ideas into the whole process of local planning through consistent respect for the integrity of the five dimensions (economic, social, political and institutional, spatial, environmental). This approach to implementation can be called 'big' Agenda 21. Two scenarios for its development have been followed in Poland, both of which focused on the inclusion of LA-21 into the process of local planning and creating a set of planning documents in a more socialised way. In both, the strategy for sustainable development has had the key role as a document for integrating all major local policies: economic, social, environmental and spatial.
   - In the first scenario, LA-21 was created as environmental protection plans which were included (and integrated) into local planning strategies. Such LA-21 plans were created in Gdańsk, Warsaw and Jelenia Góra. This was also a very important stage for creating the pilot concepts, upon which the UNDP Umbrella Project's standards were built.
   - In the second scenario, LA-21 was from the very beginning included into the process of strategic planning in local authorities. Again, a decisive role in promoting this practice was played by the UNDP Umbrella Project (see case study 9.C2).

The question is what should local government do to prepare LA-21? The best answer to this is the second of the above scenarios. In essence, LA-21 is intended to activate and use social structures via the '3C': cooperation, co-responsibility and co-decision, which refers to the following:

- creation of a sustainable development vision ('what objectives are we going to achieve?');
- defining ways of achieving the vision ('how to achieve the objectives?'); and
- implementation of the vision and monitoring of the process ('are we approaching or receding from our sustainable development objectives?').

Preparing LA-21 should be the essence of the development planning process for local authorities. Moreover, the Agenda should differentiate this type of planning from conventional development planning at the local level by giving it the following attributes.

1. All levels of strategic documents are subject to the concepts of sustainable development, with reference to quality of life (as an overall objective) and different dimensions (economic, social, environmental, spatial).
2. Creating and implementing Agenda 21 means a socialised planning (based on partnership) process of implementation of sustainable development principles. Without the involvement of local communities in decision making, creating and implementing LA-21 is not possible; and neither is building a civic society.

3. LA-21 uses the method of socialised planning (a participatory process; tool 1.T3). In the process of creating and implementing the strategy, a system for social communication is being built. This includes: the style of communication, building trust and confidence between participants of the process (including the local community), conflict resolution, and team work. Important tools in the system are questionnaires and other forms of public survey, applicable in the planning process. Participatory planning is based on the practical implementation of the idea of inter-sectoral partnership in the process of sustainable development planning.
4. The social character of building the sustainable development strategy process is undoubtedly a challenge for local authorities. It means taking full organisational responsibility for the process, openness with society and giving it a key-role in the process. The role of local authorities is then to support and stimulate social movement within the process of creating the strategy and its implementation. The local authority must follow the progress of work, provide formal acceptance (via a resolution from the local authority) of the plan as established through collaboration, and monitor its implementation and progress.
5. Participatory methods of preparing strategic documents, especially sustainable development strategies have become increasingly popular. However, based on experience in implementation of the UNDP Umbrella Project's standards, it can be seen that there are certain barriers to a wider socialising process in creating local development plans. In fact, there is a substantial lack of preparation by local authorities for the process of socialising creation and implementation of plans, and also inadequate preparation for local or regional communities to participate in the process (see case study 1.C3). In the first instance we face lack of knowledge on possible ways to involve society in decision making and also a lack of positive experience in understanding the role society may play in socialising the process. This has resulted in a very formal approach to the problem and treating social involvement as an extra load that prolongs and complicates the process. In the second instance, the problem is that the idea of social participation is not entirely understood during the overall process and it is not treated as a means for cooperation with local government, but often as an opportunity for stopping the activities and resisting local authority decisions. An additional problem is a weak motivation for taking action, of which the reasons include a lack of knowledge about sustainable development concepts, scepticism about plans, misperceptions of the advantages and a lack of trust in the good intentions of people engaged in the process (i.e. a lack of genuine leaders in the regional and local community).

Questions

1. What differentiates traditional local development planning from the process of creating and implementing Local Agenda 21?
2. What are the barriers to a broad socialisation of the process of building local development plans in your community/district?

Case study 9.C2.
The standard of the UNDP Umbrella Project

Since 1997, the UNDP Umbrella Project has offered assistance to local authorities in Poland within its programme framework known as 'Preparing sustainable development strategies in communities and districts, according to Agenda 21'. In 1997, within the programme the following were established:

- a methodology for socialising the process in building a strategy;
- training a group of consultants; and
- a group of local authorities selected to take part in the programme, based on several missions that verified these stakeholders' ability to engage in a participatory process.

Within the standard, the sustainable development strategy was treated as a document that summarised the key stages of building LA-21 which will emerge from a social process aiming at sustainable development. The methodology for preparing a sustainable development strategy according to the guidelines of Agenda 21 is based on social process of communication, perceived as a key tool for the development of local democracy.

The process of partnership planning, organised in 4 or 5 strategic workshops, involves the representatives of different units from each local authority and other local stakeholders including: members of local authorities, members of city councils, local leaders, representatives of NGOs, business, and all people interested in local development. During the workshops and meetings between stakeholders, the following documents were elaborated and approved (figure 9.5):

- a report on the current state of sustainable development;
- the mission and vision for development;
- the structure of objectives, where the leading objective is sustainable development and the overall objective is the quality of life (strategic plan);
- plan of activities (operational plan); and
- a system of managing the implementation of the strategy.

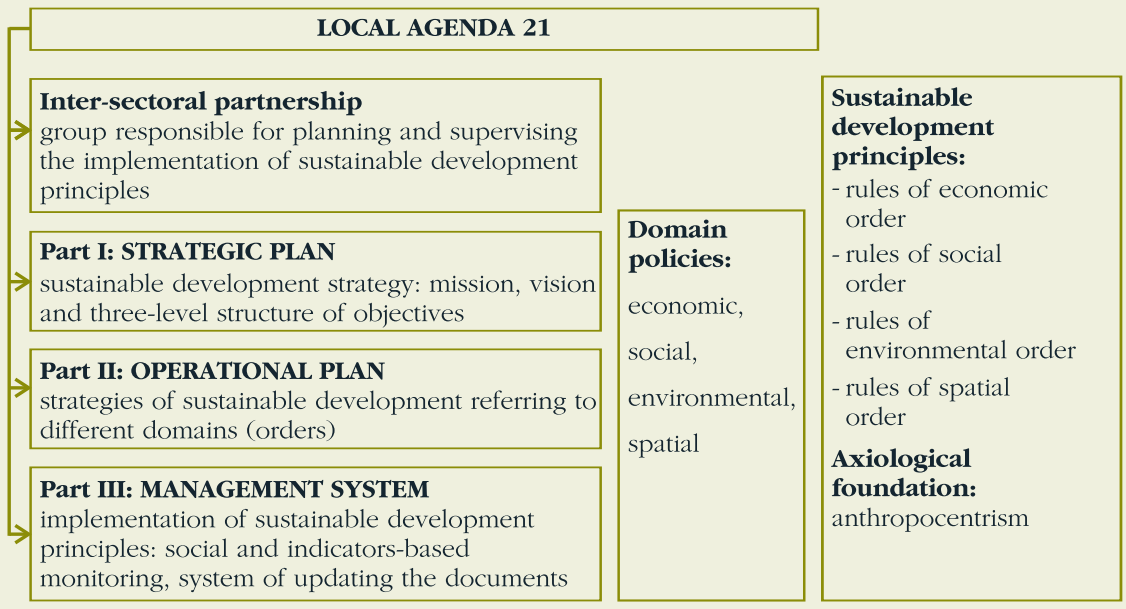


Figure 9.5. Strategies in local planning for sustainable development

The UNDP Umbrella Project's standard featured the following five main features for preparing the strategy and managing its implementation.

1. Use of a three-level structure of strategic objectives, with a clear reference to sustainable development in this structure.
2. Using the notion of an integrated order in the process of building a strategy. The interdependence of basic sustainable development domains means that a strategy has to refer to each of them at the same time. This influences the structure of the strategy and settles the multi-sectoral representation of the group preparing the strategy. In the UNDP Umbrella Project standard, the arrangement of sustainability dimensions decides on dividing specific objectives into groups and the arrangement of an operational plan (plan of activities).
3. Using the principles of sustainable development to test whether the declaration of implementation of sustainable development refers to the most important issues to which it should be referring.
4. Approving the special role of the management system for sustainable development strategy implementation (see also description of sustainability management system in chapter 4). In practice, such a system is often underestimated, but it has a decisive impact on the dynamics of the implementation of a strategy. According to the standard, such a system has three subsystems as follows:
   – the instruments of strategy's implementation;
   – monitoring of the implementation of the objectives and tasks indicated in the strategy and of their changes; and
   – the strategy's updating.
5. Treating partnerships and social communication is a basic objective in the process of creating, verifying and implementing the vision for local development. Two social pillars are highlighted in the UNDP Umbrella Project's standard as necessary for building LA-21 as follows:
   – building the strategy in the process of participatory planning; and
   – creating an institutional setting for social monitoring of the strategy's implementation.

Establishing a planning group was accepted as the best approach to creating intersectoral partnership for sustainable development. A representative forum (such as a council for sustainable development, Local Agenda 21, or a steering committee), assembling representatives from different sectors, should elaborate strategic documents and lead the social monitoring of their implementation. Such a forum should not only be brought together for a temporary period for drafting strategic documents, but it should also be a permanent institutional element of partnership relations at local levels of governance.

According to the statutes of these partnerships, they are voluntary agreements between members that are made in order to prepare and implement a local vision of sustainable development. Within the framework of implementing the standard, most of the partnerships were set 'near' the community or the district council. In some cases, the partnership functions under the patronage of a strong NGO or is transformed into foundation or association.

Making partnership agreements is the basic form of socialising the process for building and implementing the strategy. According to the UNDP Umbrella Project standard, these should be enriched with other forms of social consultation, such as opinion polls or open discussions. The aim of all forms of process socialising is to prepare

conditions for expressing opinions and ideas by residents and to respect these during the process of building the strategy and monitoring its implementation.

After a successful pilot programme in 1998, the following years resulted in a dynamic growth of a number of strategies implemented in Polish local authorities. By the end of 2000 almost 70 local authorities (of which more than 60 were at the community level) benefited from the UNDP Umbrella Project's assistance. These local authorities had their own sustainable development strategies, prepared and accepted in a process of partnership planning and a widely accepted social communication. In the years that followed this, after publishing the results of the UNDP Umbrella Project's work, the diffusion of this standard in Poland was established. The same was true of the standard of sustainable development strategy audit, another standard developed by the UNDP Umbrella Project.

Questions

1. From the perspective of disseminating Local Agenda 21 in Poland, what was the significance of introducing the idea of an integrated approach in the UNDP Umbrella Project's standard?
2. What should a sustainability management system in a local authority consist of? Compare your answer with the structure outlined in chapter 4.

Chapter 10.

Urbanism

10.1. Introduction: urbanisation challenges

Since the beginning of the 21st century, more than a half of the world's population have lived in towns and cities. In the 27 European Union countries, this proportion reaches 74%, while for example in the Netherlands and in the United Kingdom urban residents constitute about 90% of their respective populations. Whilst towns or cities occupy presently 2% of the Earth surface they consume 75% of its resources.

In view of accelerating cultural, demographic and economic changes, questions arise regarding the sustainability of present-day models of urbanisation and of the principles and methods used in landscape design. In recent years, we have observed the revival of urbanism as a lifestyle. Post-industrial civilisation and growing concern for environmental quality have contributed to the elimination of a number of threats and inconveniences in urban areas because cities that ensure a higher environment quality serve their residents well. These cities also attract newcomers who are able to choose their place of residence, who are mainly representatives of the 'creative class' (Florida, 2005). Thus, in this way well-managed cities gain yet more developmental impetus.

In this chapter, we see that properly planned urbanisation, optimisation of development intensity and density, and integrated spatial planning and management, can set aside large areas for cultivation beside natural areas beyond the city limits. At the same time densely populated and well-planned cities become safe, comfortable and attractive.

Unfortunately, we have not been successful in controlling the processes and forms of urbanisation everywhere. In developing countries, we face excessive expansion of metropolitan areas and polarisation of urban communities. In Poland, we also have not been able to cope with a spontaneous and chaotic sprawl, with its appropriation of space, alongside the continuous degradation of rural areas. We lose specific identities of various landscape types which are important, and non-renewable or at best slowly renewable resources.

Thus, the way we shape our cities and estates will determine their image, their surroundings, and their modes of operation, alongside the quality of life for residents over decades or even hundreds of years. Why is the Polish model of urbanisation so adversely divergent from the European norms? Why are old towns and cities usually more attractive than the new districts and housing estates? How can we improve our spatial management and planning tools? Answering these questions is best done by starting with a brief synopsis of the origin of the present-day urban environments.

10.2. Evolving concepts of the city

The ideas and structures of cities have matured over several millennia. We know of certain historical periods in which cities developed particularly well, in that their relationships with the environment were harmonised, their economy was growing, and the living conditions of their residents was improving. The success of cities was primarily decided by their political and legal systems alongside their spatial layout. Since antiquity, the most established cities were those with self-government, planned development and

well-designed layouts, usually regular, but built in accordance with local physiographic features.

The morphology of our towns and cities gradually evolved in the period from the Middle Ages to the Industrial Revolution. However, the sudden acceleration of urban development in the 19th and 20th centuries resulted in dramatic and unforseen transformations of the existing social and spatial layouts. Cities lost their previous shape and form, whilst environmental conditions and social relationships deteriorated and the poor districts grew.

To stop these pathological trends, the most developed countries implemented modernisation projects that consisted mainly of demolition of old structures and establishment of green areas, together with the imposition of minimum standards for housing. At the turn of the 20th century, completely new concepts of urbanisation appeared. The best known of which was the garden city (Howard, 1898), which was based on a planned combination of a dynamic city economy, with strong social bonds, and the healthy climate of the countryside. A present-day interpretation of this concept in Poland was the design of the Siewierz eco-town, which we will describe later in the case study of section 10.C2. Another comprehensive urban system concept within a large city structure is the neighbourhood unit which is a group of residential buildings, integrally composed with their own rich social and service facilities. In Poland in the inter-war period, the social settlement concept was established on the basis of the neighbourhood unit which was followed by the Nowa Huta masterplan after WWII (see case study 10.C1).

The Athens Charter, published in 1943, contains the principles of modern, functional planning. The goal of the Charter was to improve the quality of the urban environment through a radical change of the planning system and the rudiments of urban design. The charter influenced in an unprecedented manner the forms of urban reconstruction and development that took place after WWII. The changes consisted of the construction of residential estates as hygienic and open structures, creation of separate commercial and service centres, and the establishment of separate industrial and recreational zones. Proper functioning of cities, which have been subdivided into zones, was to be supported by expansion of transportation networks.

The practice of modernist urbanisation often went far beyond the traditional concepts of urban communities, neighbourhoods and public spaces. Functional segregation and expansion of road infrastructure caused a fragmentation of previously integrated and compact structures. This departure meant that urban blocks and terraced houses, were replaced by high-rise, detached buildings and superblocks, which produced non-functional spaces bereft of a sense of ownership. The imposition of isolated structures into the historical urban fabric destroyed neighbourhoods, townscape identities, and cultural traditions associated with the historical urban space. Extensive land use caused rapid expansion and fragmentation of urbanised areas. Subsequently the boundaries of towns, cities, suburbs, and rural areas have now been blurred. This is why it is so hard today to find any urban structures that represent an unambiguous and clear nature.

The book by Jane Jacobs, *The death and life of great American cities* (1961), was a turning point for 20th century urban theory. The author was one of the organisers of the Greenwich Village community action against the plans for neighbourhood modernisation and construction of a highway. In Jacobs's book, the intensity of community life in historically developed urban neighbourhoods was clearly being appreciated for the first time. A traditional street, which for the modernists such as Le Corbusier had been a symbol of

the cityspace degeneration 20–30 years before, was presented by Jacobs as an ideal environment for inter-generational contacts, one that was safe, comfortable, interesting, diverse, vital, and beautiful. Jacobs clashed the image of old urban neighbourhoods with the new reality of mono-cultural apartment buildings and monotonous dormitory suburbs.

10.2.1. Post-modern urbanism

By the turn of the 1970s, many planners and architects became aware that the implicit implementation of modernistic planning principles and the inhuman scale of many post-war structures were leading to the reduction of quality of life, despite rises in sanitary standards and enlargement of per capita residential space. What was characteristic of postmodernism was the return to space of an urban nature, with a domination of historical values, neo-regionalism and local identity. Urban design was thus supplemented by various cultural experiences. The study of proportion, measurement, signage, meaning and symbolisn were brought back.

Early in the 1990s, the New Urbanism became quite distinct. Owing to the development of effective planning tools and free-market principles, the New Urbanists managed to combine a high quality pedestrian space with a mix of uses, urban density, compactness, and permeability. Searching for an ideal space to integrate local communities and limiting car dependence, the New Urbanists celebrated local history and building practices but also underlined the values of their own research in the essence of the neighbourhood and urbanism. In their publications (for example Duany et al., 2000), they shared dozens of years of experience of their struggle to change the spatial planning paradigm and overcome the road to engineering dominance over humane urban design.

New Urbanism introduced innovative and effective methods and tools to planning practice. The high market value of designs and the 'missionary' work, carried out through the Congress for the New Urbanism (CNU), resulted in hundreds of projects up to the present day. The Congress's programme is determined by the Athen's Charter, and summarising the principles of sustainable spatial planning on various scales: from the regional to the urban block to the public space. This document is supplemented by the list of the Canons of Sustainable Architecture and Urbanism.[1] CNU is an international organisation and co-operates with NGO's with similar interests in Europe, for example the Council for European Urbanism, INTBAU, and The Prince's Foundation for the Built Environment.

A return to the urban traditions is based on the selection of those values, principles and forms that, having progressed on a developmental path through the centuries, fulfilled the criterion for sustainability. The first large projects completed in that spirit, Seaside, Florida (1984–1991) and Poundbury, Dorset (est. 1993), have sometimes been criticised for their archytypal and elite character, although they remain convincing in their cohesion of an idea and its consistent implementation. It is also worth noting that their construction costs were not much different from average ones, and in the Poundbury development 28% of the first stage consisted of social housing (see the Poundbury case study described in subsection 10.4.7).

The modern movement is also developing in a more sustainable way. The selection of technology has become more restrictive, and in view of climatic change it has became a priority to use renewable energy. IT tools allow for optimum and fair access to the solar energy and light even in densely developed urban districts, with optimisation of air

[1] Both documents can be downloaded from <www.cnu.org>.

flow and traffic permeability. The idea of sustainable urbanism that is technically advanced, but primarily friendly to humanity and the environment can be implemented via the creation of complete neighbourhoods and districts with zero CO_2 emissions self-sufficiency in energy, or even generation of surplus energy. For example the pioneering BedZED project (see subsection 10.4.7).

10.2.2. Environmental design

Regardless of the multiplicity of trends, pro-environmental tendencies are starting to dominate today's theory on urbanism. Wheeler (2004, p. 30) specified a number of features which distinguished the recent urban worldview from the postmodernist one as follows:

- in an area of values, next to pluralism, sharing core values based on common problems is established;
- in the cognitive area, the significance of interrelationships, networks, systems, ecology and chaos theory are highlighted instead of relativity and uncertainty;
- in the area of politics, instead of undermining authority, flexible and evolving relationships between different institutions are proposed; and
- in the field of planning, decentralisation, pluralism and dialogue are recognised as inadequate. The role of education is stressed to help evolve public understanding of planning objectives. Shared goals are to be achieved through advocacy, evolving incentives and mandates between different levels of government.

Thess local grassroot initiatives are exerting stronger and stronger influences on the urban environment. That process is supported by the movement called *placemaking*. It involves not only urban planners and architects and is usually conducted by non-government organisations and largely based on voluntary work. In addition to the improvement of economic vitality, the social environment, and landscape quality, the goal of the movement is to integrate local communities (PPS and FPdŚ, 2009).

10.3. Conditions for spatial planning in Poland

Despite the Polish successes in democratisation and efficient economy building, spatial management appears to be nevertheless ineffective. We have not developed proper methods and instruments for planning (tool 10.T1), design and control of settlement structures or urban form.

In Poland, new developments and infrastructure networks are not shaped as logical elements of urban or rural systems. Buildings and estates are adjusted to incidental plot sizes and shapes that ignore the spatial context. Despite considerable investment potential of inner-city areas, it is easier and cheaper to invest on the outskirts, and that is the reason why we see a progressive sprawl of suburbs and diffuse development in rural areas. Consequently, in comparison to usability effects, occupied areas are disproportionally large whilst the destruction of the environment, natural and cultural identity are profound and widespread. Unplanned sprawl of housing for example reduces the effectiveness of public transport. The dependence of residents on private cars increases their personal and environmental costs (which will be highlighted in the next chapter).

Together with increases in physical distance, social bonds are weakening. On this basis the number of gated communities is growing and the privatisation of space is increasing. The city is changing into a mosaic of enclaves and exclaves, with the domination of the latter, namely for exclusivity, exclusion, isolation and marginalisation (Pirveli and Rykiel, 2007).

In many cases, Polish villages are have been even more affected by dispersion and chaos than have towns and cities. Compact forms of historic streets, rows, forked or square types of villages are no longer clear, and most new houses are located a large distance from the existing settlements. Landscape destruction is accompanied by dramatically growing costs of stretched infrastructure, which are finally borne by residents and nature.

As a result of uncoordinated planning permission, the harmonious forms that were characteristic of European urban and rural spaces have been replaced by unconnected diversity of architectural forms, fencing and landscaping. Anarchy in the use of advertising and visual information further intensifies the pollution of landscape.

However, we can also see that positive changes have taken place in recent years as old town centres have been restored. The construction of ring roads has allowed residents to regain central squares, which, decades ago had been turned into car transportation nodes. After improvement of the quality of both technical and social infrastructure, local governments more and more have become involved in activities aimed at improvement of secure public-space and comfort. NGOs have conducted educational activities regarding public space and prepare residents to participate in the planning and design processes. Both commercialisation and democratisation are challenges for urban planning, which had been top down rather than bottom up through negotiations, debate and a search for consensus. The necessity of applying new and effective tools for spatial planning is becoming increasingly evident.

Tool 10.T1.
Development planning and programming

Sustainable development requires strategic, coordinated activities that take into account the dynamics of the development processes. What can be of key importance is the specification of priority areas that are the most valued and important for an ordered urban structure, these include: activity areas (for building investments) and protected areas (where unplanned development would cause loss of values and resources or a breach of essential spatial balance). The most important strategic decisions relating to the majority of our cities and towns are associated with transportation policies and the determination of the areas for conservation by prohibiting development. These decisions occupy a central position in models of polycentric settlement networks, compact cities, and smart growth.

Strategic and operational plans

A strategic plan should highlight the initial situation, the goal and the path leading to it, and methods for evaluatiing progress. Basic sustainable spatial development strategies are associated with the following topics: regeneration and reuse of urbanised land; designing green space; cultural heritage preservation and management; urban and transportation network design; density optimisation; promotion of mixed–use; localising and identfying sites for new buildings; promotion of affordable housing; accessibility to municipal and social infrastructure; renewability and adaptability of building structure; energy efficiency; quality and sustainability management; and finally urban design and architectural standards. Increasingly urbanisation strategies also take into account the development of information and communication technology.

The territorial range of strategic plans should be broad enough to connect place management with its natural and cultural landscape. Some areas, for example pro-

tected landscape or the urban districts selected for revitalisation, require the determination of detailed and rigorous standards. In other places, plans can be more general. However, in any case they should always establish basic standards and inspire innovation.

Operational plans serve attainment of objectives determined in strategic plans whilst effective operational planning depends on the implementation of quality standards, schedules, monitoring, and evaluation. Operational planning is based on urban space management and process control; not top-down control, but rather the empowerment of citizens, competitive services, financing of outcomes rather than the activities, of entrepreneurship, decentralisation of decision making and responsibility, market mechanisms and local marketing.

Urban revitalisation programmes

Revitalisation is a broad and ambiguous term even within the EU, there are differing organisational, financing and implementation schemes of revitalisation that are in use. Urban revitalisation is often comparedwith recycling. It is supposed to counteract degradation, bring back to life the most endangered parts of a town space and lead to their revival. Revitalisation consists of the activities that stimulate and encourage development, with an emphais on qualitative changes in the environment and the full participation of local residents. The purpose of revitalisation activities is not to renew buildings, but rather to increase the residents' quality of life and the competitiveness of the place beyond a local scale, and based on its own cultural, spatial and economic potential. Therefore, revitalisation requires an interdisciplinary approach, where the role of urbanists consists of the coordination of those operations carried out by various sectors and entities. Inner-city revitalisation has been defined by Zuziak (1998) as 'the structural changes consisting of the strengthening of activities and attractiveness of urban space through a coordinated strategy between the public and the private sectors'. The success of revitalisation depends to a large extent on the use of the heritage potential and requires a proper understanding and interpretation of local cultural space. Characteristic, authentic and unique qualities are the assets the correct identification and strengthening of which will decide the future competitiveness of a given place (Zuziak, 1998).

Public sector representatives should pay special attention to the need for stabilising social structures in the area subjected to revitalisation. Experiences in western countries indicate certain threats from the gentrification of inner-city areas. As a result of their renovation, renewal or improper realisation of a revitalisation programme, a sudden increase of real-estate prices can occur, resulting in the displacement of local residents. Gentrification is a phenomenon with two faces: one which consists of giving nobility to space, and the other which can lead to making an area socially barren, with a subsequent return to degradation.

10.4. The principles of sustainable spatial development

Many theories, models and principles are associated with the ideas of sustainable urbanisation. The literature on the subject uses such terms as smart growth, urban containment, the compact city, the urban village, the ecopolis, low-carbon urbanism, and new pedestrianism, etc. Each of those concepts contains ideas that are essentially correct but only for specific local conditions. Sustainable urbanism is supposed to serve both improvement in people's quality of life and reduction of pressure from human settlements on the

environment. In the sections below, we look at a concise set of principles on each of the concepts cited above.

McHarg (1969) noticed that a synergy is possible in increasing both effective improvement of the natural environment and the urban space. An important obstacle, however, is a deeply rooted, traditional view that nature and the city are in opposition (Whiston-Sprin, 1984, p. 115). To be able to design the city as a part of the natural environment it is necessary to change cultural and planning paradigms.

10.4.1. Concentration and density

Productivity, functionality and attractiveness of urban space depend on population density and intensity of land use. Economic benefits of increased concentration of buildings seem are obvious: through lower costs of infrastructure and transportation, and the ability to preserve larger green areas, such as: parks, arable land, forests, and protected areas of natural beauty. To save the identities of the unspoiled countryside, as well as the agrarian, suburban and urban landscapes, the boundaries of cities and other settlements should be sharp, legible and inviolable (figure 10.1).

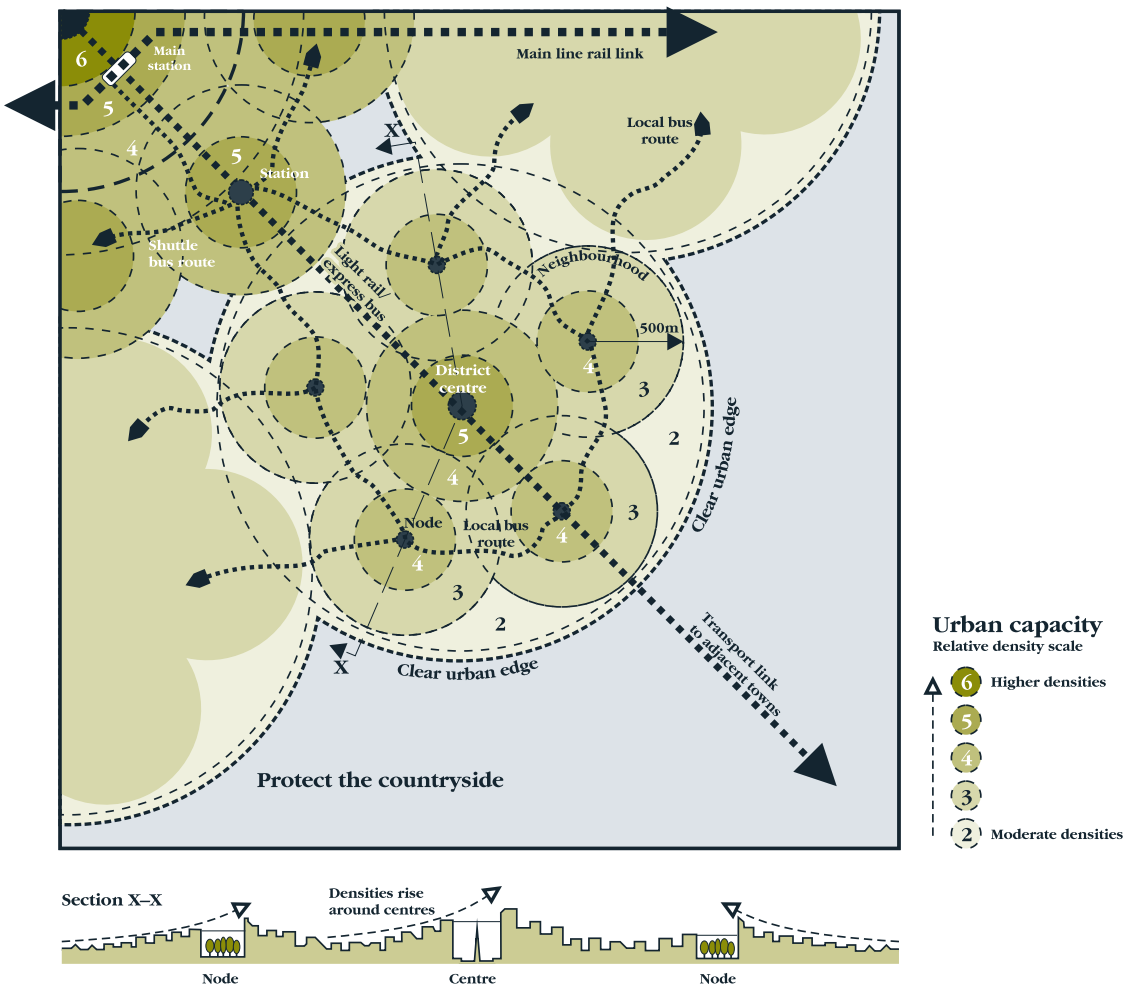


Figure 10.1. Areas of the highest density located around transportation nodes marked by clear boundaries of urbanisation (Rogers and Power, 2000)

The activities aimed at increasing density are not always understood and therefore not always accepted. The ideal of the single-family detached house and the fear of living in densely populated areas still dominate. Instead of talking about the need for density, better-sounding terms are often used: compact development, smart growth, or walkable neighbourhoods (Wheeler, 2004, p. 190). According to Cooper-Marcus and Francis (1998), urbanists need to do their best to ameliorate the negative effects of high population density and demonstrate all the benefits of such density. The feeling of density does not result only from the number of residents per hectare because two areas with the same population density can be perceived differently, and this difference may result from urban composition, availability of public space, accessibility, amenities, landscaping, and many other factors that individually shape a sense of the place.

Dense urban centres and medium-dense suburbs support the development of social infrastructure because the multi-functional city is a product of spatial evolution and adoption to human needs. Historical experience indicates that such forms of space organisation, in contrast with areas of scattered development, provide a significant potential for adaptability to changes in civilisation. Traditional urban space is functional and beautiful, as is proved by for example the high popularity of historic towns that become tourist attractions. Central squares and boulevards, compact districts and unique neighbourhoods, street frontages, yards, courtyards and arcades, gardens and parks, all serve various purposes suited to our needs as the individuals, such as: living with family, among friends, neighbours and acquaintances; provision and use of local services; and joint participation in the cultural, political and religious events that take place in the public space.

Sustainable urban space contains all the needed services and workplaces, together with cultural and recreation facilities, inside or in a close proximity to housing projects. The ideal is a distance of no more than a 5–10-minute walk of 300–800 metres. Within that range from each place of residence, basic commercial facilities, nurseries, kindergartens, primary schools, local community meeting places, public sport facilities, health centres, community gardens, and small parks should be situated. A well-planned and designed town space can become an environment in which we can live a full life, meeting most of our daily needs and ambitions in a fairly small area. More distant amenities and facilities for higher education, cultural centres, or large park complexes, should be easily accessible by bicycle or public transport (figure 10.2).

The lower the population density, the larger the per capita costs of landscaping, green space maintenance and municipal infrastructure, and the lower the accessibility and quality of respective services. The viability of a local centre with shops and services (such as a school, health and leisure centres, grocerie shops, small restaurants, and a post office) requires a population of at least 7500 people. With the density of 50 persons (or 23 residential units) per hectare, 50% of the population live in a distance of more than 500 m from these basic services. Such people are more likely to use cars on a daily basis because bus services are not viable in the areas of this density.

A density of 100 persons (46 units) per hectare provides more diverse social structures, and allows for the provision of good bus services. In an area with a density exceeding 150 persons (69 units) per hectare, all the indispensable services are accessible to pedestrians, and the viability of various forms of public transportation increases.

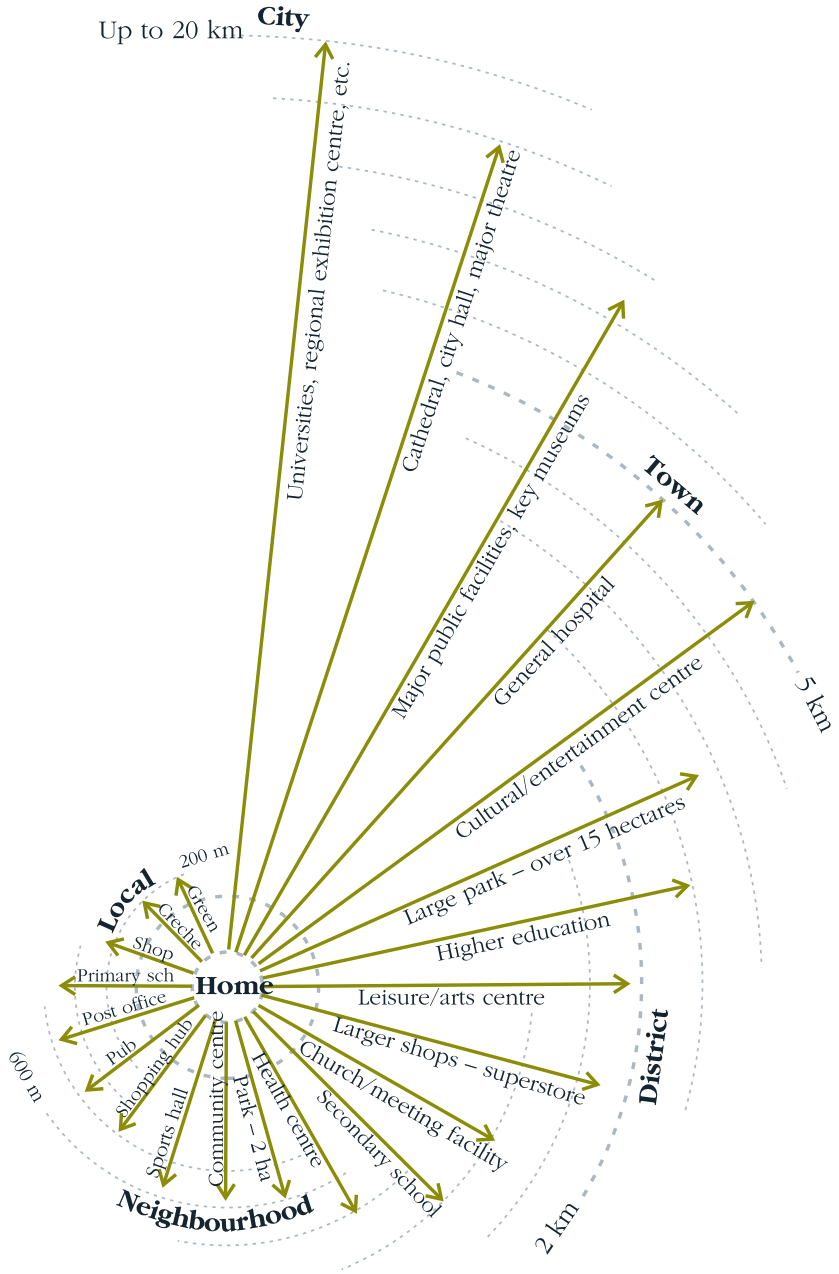


Figure 10.2. From neighbourhood to city: the basic social life ingredients (Rogers and Power, 2000)

10.4.2. Forms and use of urban space

In addition to population density and intensity of development, urban grain, height and shape are of paramount importance. Dense development does not necessarily mean high-rise development because the highest efficiency is gained via 4–6 storey buildings. Figure 10.3 presents a diagram of three approches to achieving the same density of 75 units (about 165 residents) per hectare.

The urban block presented at the bottom of figure 10.3, creates the most multi-functional and socially diverse (owing to availability of different sizes of flats and houses) and a well-integrated an environment. Continuous frontages allow for the formation of well-defined streets, squares, and quiet, semi-private yards, or gardens.

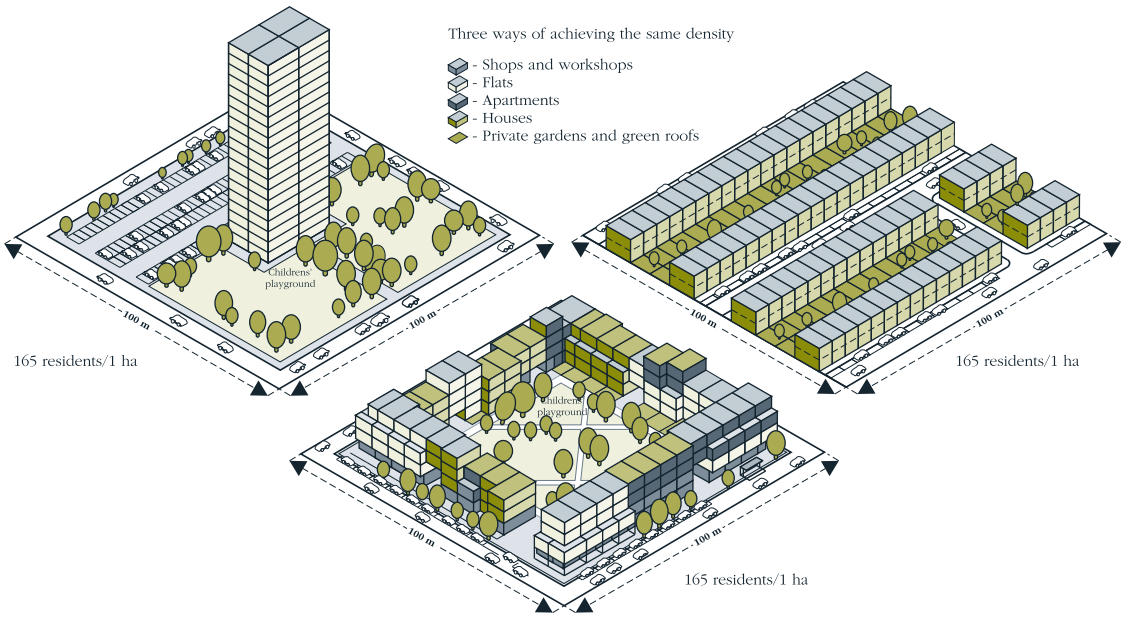


Figure 10.3. Three types of development, the same density (adapted from Rogers and Power, 2000)

Town squares traditionally concentrate the social, cultural and commercial life of local communities. Once, these used to be primarily places for the exchange of products, services and information, while today it is the recreational functions that predominate. A square should constitute a centre for each district, being a meeting place, surrounded by the most important public, municipal, cultural, service and retail facilities, mixed together with its residential functions.

What is important for quality of life and urban community development is the presence of greenery and quality green areas, penetrating and permeating compact town structures as a 'blood-circulation' system. Sequenced urban and green interiors make moving around and staying in the city more attractive.

Openness and permeability of all estates should become the principle, together with accessibility and mixed use of the places that are active 24 hours a day, 7 days a week for various purposes by various users. The residential function is of key importance because the regular presence of people increases actual security and a feeling of security. Mono-functional spaces like business parks, shopping and administrative centres, or gated estates disintegrate urban structures and are empty at certain times of the day or night making them insecure. Fences, cameras, police and security-guard patrols are not so effective against crime as the presence of various people, first and foremost residents who can observe from the streets or windows at any time.

10.4.3. Historical heritage management

Urban space is dynamic. The nature and identity of the landscape evolves together with the architectural substance, infrastructure, greenery and form of human activity. Historical heritage management should ensure a balance between the changes that are natural in a cultural space and the preservation of precious elements of identity and heritage. The balance between protection and development processes, whilst reconciling the interests represented by various social groups, is also favourable to the development of culture.

Cultural landscape quality essentially affects quality of life and a sense of community,

the collective feeling of values and pride, social activity, and the vitality of the local economy. Cultural heritage should hold a real position as a factor that shapes planning solutions and should not be treated as 'circumstance' or an obstacle as it quite often happens at present (see case study 15.C1).

10.4.4. Green infrastructure

One of the most important strategic goals of urban planning is to preserve the right proportions between the urbanised areas and open ones, especially in metropolises. This goal is fulfilled through green infrastructure: consciously formed and through continuous elements of a city structure that can assure the proper functioning of the natural environment, designed with regard to social, cultural, transportation and structure-building functions.

We can distinguish three concepts of green structures, developed at various times and based on various theoretical ideas as follows: green belts (as buffer zones), wedges, corridors and ecological networks, created to ensure the relative long term sustainability of ecosystems and landscape throgh maintenance of spatially interconnected natural and semi-natural areas. Networks consist of areas that are slightly transformed by humanity, that are characterised by a diversity and stability of ecosystems, and of nodal areas (or bio-centres) which help ecosystems and species characteristic of a region to survive.

A condition of network existence is that it counteracts isolation. To ensure the continuity of green structures, the regional and metropolitan network plans should be treated as a national objective in determining the interconnections between local networks. In practice it is necessary to integrate protective functions with agriculture, forestry and recreation to attain the structure-building role that these networks offer (Szulczewska and Cieszewska, 2008).

10.4.5. Social space

Well-planned, accessible and useful public space is fundamental for a sense of community and thus an indispensable component of sustainable urban structures. The optimum functioning of public places requires quality amenities and generated social activities which may be achieved via good design standards and efficient management. Basic standards include the arrangement and furnishing that guarantee accessibility to such places by senior citizens, children, parents with babies and people with various disabilities. Local authorities are responsible for the quality of public space. In highly developed countries, safety, comfort and beauty of public spaces are the basic criteria for evaluation of local government.

The interface between public and private spaces is of key importance to the development of small, local businesses. Ground floors of the buildings adjacent to streets and squares have high potential for business activities on the condition that safe and comfortable access is provided. Calmed traffic and wide pavements allow for the introduction of certain services into public space, for example in the form of very popular restaurant or café gardens.

Cooper-Marcus and Francis (1998) assert that semi-public spaces become more and more important. Such spaces are associated with various types of public institutions, for example offices, schools, libraries, hospitals, or nursing homes that serve specific groups of users with particular needs and expectations. This is especially true in large heterogeneous and busy urban centres, where people who are tired of the fast pace of life need a feeling of security and predictability that can be found in such enclaves.

The return to traditional urban block development results not only in the creation of well-defined street and square interiors, but also allows creation of semi-private courtyards and yards, which, although remaining open to the outsiders are nevertheless used mainly by local residents. A sense of belonging is shaped in such places by spatial form and a despite lack of physical barriers to access the division between the private and public domain remains clear. The urban block interiors constitute ideal environments for the growth of neighbourhood communities; with an informal supervision of playgrounds and the creation of relaxed and inter-generational places of integration.

Tool 10.T2.
Spatial management

Traditionally understood spatial planning is an indispensable tool, although often an inadequate one. For example the 2008 INTA (International Association for Urban Development) Congress concluded with the statement of the necessity to switch from the urban planning formula to one of integrated urban management.

'The Leipzig Charter on Sustainable European Cities' obligates Poland as a member of the EU to formulate and consistently implement such an architectural policy. The document prepared by the Main Commission for Urbanism and Architecture (Główna Komisja Urbanistyki i Architektury) in 2009 'The Government Urban Policy' (Markowski et al., 2009), contains many proposals for methods and tools for urban development management that support urban sustainability. These include legal and financial tools for rational intensification of land use, land purchases for public projects and social infrastructure financing. The proposed tools should help municipalities to implement their own developmental policies, integrate spatial and budgetary policies, and integrate spatial planning with other developmental plans.

For example, 'The Government Urban Policy' contains the following proposals:

- designation of land around railway stations for local centres and town-building functions;
- prohibition of the construction of houses on the areas bereft of waste-water management systems and distant from paved public roads;
- prohibition of gated housing estates and prohibition of restricted internal-road accessibility;
- introduction of urban fees, taxes and systems for tax deductions or relief, allowing local governments to revive degraded areas effectively;
- preferences in the distribution of financial resources for integrated urban design or landscape design projects;
- introduction of layered rights to real estate, stimulating infrastructure development (parallel use of land and buildings above and underground by several owners will make it possible for example to build tunnels, bridges, flyovers, without the necessity for expropriation and purchase of land for municipal projects);
- introduction of local laws regulating billboards and other visual advertisements; and
- promotion and development of new forms of integrated town centre management (TCM).

In respect to large residential estates, it will be necessary to formulate a national strategy, as well as local strategies, interconnected with local housing markets. This has been recognised as necessary to implement for example revitalisation and reurbanisation activities, such as: infilling, transformations and replacement

of structures; monitoring social, spatial and technical conditions; financial support for framework transformation plans designed for large estates; and also prohibition from creating new residential mono-structures (Markowski et al., 2009).

Planning and urban design standards

Planning and urban design standards are the spatial quality and quality of life improvement tools that are most often proposed by urbanists. Obligatory standards relating to utilitarian, cultural and ecological qualities can determine the rules and parameters of urban space management and urban form, in accordance with the principles of sustainable development.

These standards should reflect integrated programmes because they can determine minimum health and social conditions which include access to: healthcare facilities, nurseries, schools, leisure centres, public transportation, open spaces, and green areas. These standards can refer to the quality of infrastructure, energy performance of urban structures and buildings, promote higher intensity and density, and at the same time protect against over-crowding and deprivation. Thus, these standards become the grounds for spatial policies and development strategies, alongside plans and designs.

Standards, established at the central or regional levels, would determine the planning procedures and the minimum content required for local spatial management plans. The national or regional standards could also contain protective regulations referring to the areas not covered by local standards. Local standards should supplement local spatial management plans, although they would also establish rules for development in the areas not covered by the local plans, and determining the forms and uses of supplementary structures. On this basis, it would be possible for example to infill vacant or under-used parcels within existing urban areas, where today, infill development is usually dependent on administrative decisions.

Patterns, guidelines and codes

The concept of patterns in urban design is usually associated with Alexander's (1977) theory, although the tradition of treating the language of architecture as a collection of archetypal elements and patterns is much longer. Present-day attempts at application of such systems in urban design are based on pattern books, urban design guidelines and codes.

Pattern books, contrary to a general opinion, are not catalogues of ready-made architectural designs. Their authors and proponents even warn against 'catalogue architecture' detached from the context of place. They claim instead that present-day architecture should be influenced by local conditions, landscape and the building tradition recorded in pattern books in the manner that allows for individual arrangement and new interpretation. Pattern books are well-grounded in the traditional urban forms and vernacular architecture, for example in Switzerland, Austria, Bavaria, and Provence. In Poland, pattern books helped to re-shape the national style after the country regained independence, and they contributed to the landscape of for example Kazimierz Dolny, Nałęczów, Chełm or Żoliborz. An interesting post-modern example of a pattern book is that developed for Janowiec nad Wisłą, which was attached as a supplementary document to the local 'Study of Spatial Development Conditions and Directions' (*studium uwarunkowań i kierunków zagospodarowania przestrzennego*). It helps the local government verify new and important projects, although it does not have the power of a local law as it may be in some other countries (Kosiński, 1995). Form-base codes (urban, landscape, and architectural) have been widely used by New Urbanists as basic tool for implementation of regulating plans and urban designs. These are intended

to determine such things as: the unity and harmony of urban form, grain, and coherent architectural designs; obtain optimum energy performance; manage water and wastewater; and introduce harmoniously new urban complexes into the local landscape and other contextual conditions. Codes guarantee spatial coherence and they shape the identities of places. What is especially valuable is their application in small towns, garden cities and villages.

Codes can either facilitate master-planned communities, serve as an alternative to planning ordinances, or can be contained within a local plan. In Polish law, codes correspond to the regulations called the 'conditions of urban design and the principles of urban form and landscape shaping' (*warunki urbanistyczne i zasady kształtowania zabudowy i krajobrazu*). Consequently, there is a possibility to include a form-base code in the Local Management Plan. The first attempt at code implementation as an integrated tool for developing a garden city neighbourhood in Poland was made by the architects of the Siewierz eco-town (see case study 10.C2).

10.4.6. Participation

Social activity, the feelings of community and confidence are essential in a democratic system (see chapter 15). Residents should have real influence upon the shape of their environment. Only residents can impose upon themselves and other community members those indispensable restrictions that serve the attainment of spatial order. Sustainable, useful and beautiful towns and cities cannot be built by planners and architects by themselves beacuse this is the task of all the residents.

Real participation does not just exist in the consultation of completed designs, or the selection of one of limited ready-made options, but rather requires the involvement of stakeholders in the development of vision and operating programmes at the very beginning of the planning or design processes. The participation of residents in planning often becomes the beginning of a real community-building process. This is because a person who feels that they are in charge starts to care for their environment. Well-managed spaces provide residents with possibilities to meet and communicate.

The roles of planners, urbanists and architects are presently changing and shifting from the positions of leaders and artists who impose their visions, to the roles of advisors and experts offering their services to spatial users. Knowledge of the residents' conduct and motivations will change the urbanists' perspective from subjective, external and aesthetic to one that is more objective and affirmative to the complex context of place, including historical, psychological and social issues. The development of the psychology of architecture and the influence of social sciences on urbanism are converging and partly stimulating such trends in urbanism as environmentalism, neo-traditionalism, regionalism, and contextualism (Lenartowicz, 2004).

Tool 10.T3.
Social participation in spatial planning

The basic conditions for sustainable development include human creativity and possibilities for communication and active participation in local community life. Construction of an ideal town or village is a challenge for all its residents. However,

residents often share a feeling that the street, square, park, or even courtyard of the house they live is a space that belong to nobody. Consequently, they need to develop an awareness of joint ownership and responsibility.

The work of an architect and urban designer is always required to make decisions of a psychological and social nature. The development of workshop design methods was a practical consequence of planners' interests in various trends of environmental psychology and appreciation for the field studies (especially the qualitative). Such methods have been intended to either work out a consensus, or at least a compromise in conflict situations. The selection of representative partners and the finding of common language between the professionals and non-professionals are the main challenges (Pawłowska, 2008).

Charrette Workshops

One of the methods for involving various stakeholders in the planning and designing processes are *Charrette* Workshops (in the United Kingdom also known as *Enquiry by Design*). These are intense, several-day-long sessions where the representatives of local government, scholars, developers, residents and others interested, meet urbanists to prepare and verify particular solutions leading to a complete urban design vision. A *Charrette* is preceded by proper substantive preparation. Participants have a real influence on the conceptual phase of design and obtain a feeling of joint decision making increasing their involvement in later implementation processes. The *Charrettes* are a form of direct democracy and are at the same time an effective sustainable urbanism tool that helps to order developmental priorities and increase spatial value.

Since the late 1980s, the *Charrette* Workshops have often been applied in the United States and many other countries to develop revitalisation programmes, public space renewal projects, re-urbanisation of Modernist estates, urban highways, and the planning of new districts and towns. In Poland, the *Charrette* method was applied to designing for example the Siewierz eco-town (see case study 10.C2).

Placemaking

Public space is a priceless environment for human interaction, communication, retail, and information exchange; it is a space for culture and a medium for symbolic content. Ever more publications are available on the improvement of accessibility and appropriateness of public space. There are academic textbooks as well as popular handbooks (for example PPS and FPdŚ, published in 2009). While concentrating on the need to conduct field studies and attain the broadest possible social participation, these authors have proposed tools for analysis, dialogue, observation, evaluation, and organisation of the spatial transformation processes.

The largest institution that promotes the social model of urban space improvement is the 'Project for Public Spaces', a non-profit organisation established in 1975, whose goal is to help local communities in the creation, regeneration and sustaining of useful public and semi-public spaces. The PPS method allows local communities to determine and express their aspirations, needs and priorities. Participation begins at the initial project vision creation stage where solutions can be found through indepth knowledge and multi-aspectual evaluation of place. Experts play an auxiliary role in the implementation of ideas expressed by the community. It is a common vision that attracts partners, resources and new initiatives. Solutions are dynamic and based on previous small successes. Involvement increases with a feeling of shared control and ownership. Changes are then based on continuous evaluation and improvements (PPS and FPdŚ, 2009).

10.4.7. Examples of principle implementation

The idea of sustainable development has become the dominating challenge and hope for urbanism, whilst the process of urbanisation should not be treated as the source of problems, but rather as a potential opportunity. However, is the implementation of the principles cited above actually possible? Or is this vision of sustainable urbanisation another utopia? Below, we present two completely different, but equally effective examples of the implementation of the principles of sustainable spatial development.

Poundbury

The Poundbury masterplan was based on Léon Krier's conception and implemented a number of his ideas like the urban village and the urbanisation of suburbs (Krier, 2001). The area of 160 ha was designed for around 5000 people in 2500 households (the density did not reach the index that can be reached in a city, but it was twice as high as in the adjacent suburbs, which represented considerable progress nevertheless). Each block contains mixed functions including: educational, recreational, sporting, commercial and office facilities, and workplaces. The idea was to shorten the distances between houses and workplaces to a maximum ten-minute walking distance.

Poundbury was supposed to be a place with a clear character and its spatial composition follows topography rather than road layout. Consequently, the townscape is picturesque and the road layout discourages people from using their cars. Parking spaces are located in backyards and informally monitored by the residents, similarly to footpaths between houses (figure 10.4). Poundbury is served by bus lines and traffic priority is given to pedestrians and cyclists.

Figure 10.4. Gravel on footpaths improves water management and microclimate

Figure 10.5. One of the main streets in Poundbury. Traffic calming used shifting of road axis and moving buildings out of their frontage alignment. Due to arcades the street kept its width although seeming to be narrower. Subtle means that affect driver subconsciousness seem to have been the most effective

All the buildings were designed by local architects on the basis of the architectural code (tool 10.T2), which determined the allowed forms, materials and details (which can be seen in figures 10.4–10.6). Traditional technologies were applied, together with high standards for building energy performance and double water installations allowing for the grey water use. The design quality and implementation was controlled through a contract between the land owner and the developer. Buildings were handed over only upon confirmation that they complied with the code.

Poundbury was constructed by a private developer on land owned by Prince Charles who has been promoting the principles of sustainable urbanism. The prices of real properties in the town are 15% higher than in adjacent neighbourhoods. The higher costs of designs and materials were partly accommodated by higher development density and compactness. Affordable, social houses and flats have been distributed evenly across the whole area and they neither differ from other households nor influence the market value of the adjacent properties.

Figure 10.6. The local landscape is picturesque, although the essence of the design is not traditional architecture, but rather of urban composition and high quality public space

BedZED

BedZED [Beddington Zero (Fossil) Energy Development], completed in 2002, was the first zero-emission, complete, medium-density neighbourhood; functionally diversified, with local services and social infrastructure, a central square, a park, and safe pedestrian footpaths.

The design was based on the most recent expertise and technologies available, although the designers (Bill Dunster Architects and the ZEDfactory Ltd.) recognised that the project was a contemporary version of a garden city. The whole design and construction process lasted four years and the estate was built on public post-industrial land transferred to the Peabody Trust. The plans were based on Local Agenda 21 (see chapter 9), with the application of broad social participation to determine project vision and develop specific designs, select contractors and manage the construction process. The local topography was preserved as well as trees and an historical drainage ditch, with its unique ecosystem. Building materials originated from local manufacturers, and 90% of the steel used for the building construction was recycled. Passive and active energy harvesting technologies were applied, alongside rainwater harvesting and local water treatment plants.

Figure 10.7. BedZED, Beddington, Surrey, United Kingdom

In the most compact centre, a density of 117 households of different sizes per hectare was reached, and, took into account an area the of a full-sized football pitch and a local power plant burning timber waste, the average density for the whole estate amounted to 55 households per hectare. All households were located within a four-minute walking distance from a small railway station and a twenty-minute walking distance from a large one. The estate is also served by two bus lines. The central square is pedestrianised, with traffic calmed and reduced across the whole area, but without applying any drastic means, by only implementing a proper spatial composition. Access throughout the development for pedestrians was the priority.

The 250 inhabitants of the neighbourhood have at their disposal 186 office work-spaces, a nursery, a kindergarten, a bar, a coffee-bar, a club, a conference hall, a football field with backup facilities, a boule field, and a car sharing network (see tool 11.T2). The residents' association participates in facilities management. The private, council and cooperative housing projects are mixed in equal proportions. Soft (green) and hard landscaping was applied, using porous pavements. Households were equipped with passive solar heating systems, private gardens, conservatories, and lawns (figures 10.7 and 10.8). The market value of the real properties in the district are now 15–30% higher than in the adjacent neighbourhoods.

Is the construction of such complexes possible in the Polish context? Most certainly yes, and taking into account the vast undeveloped and degraded areas situated close to our city centres, the urban revitalisation and reurbanisation potential is in fact larger in Poland than it is in other European countries. Polish towns and cities can grow inward by infilling empty spaces, post-industrial and post-extraction, and post-railway and post-military areas (brown-fields and greyfields). Such sites require cleaning up of possible pollution and integration with the town space by connections with transportation routes and coverage by dense or

Figure 10.8. BedZED architecture

semi-dense mixed-use structures, with the widest possible reuse and adaptation of existing buildings. Within such structures, new central public spaces should be developed to revitalise the area. At the same time, such green areas as parks and gardens, ecological corridors, wedges and belts should be protected from development. So why is that such projects have not been adopted on a large scale in Poland? The main reason is a lack of proper planning, management and implementation tools (see tools 10.T1–10.T4).

Tool 10.T4.
Certification

The issues relating to spatial shaping that is in compliance with nature may be understood in various ways. Sustainable urban development requires holistic view of the many different factors. The requirements relating to improvements in energy performance and building recycling, as described in chapter 6, constitute only the first step in the implementation of pro-environmental standards in new Polish developments. More complex certification systems contain dozens of criteria that refer to environmental quality. In Western Europe and in the United States alongside multi-criteria certification of individual buildings, certificates for whole new neighbourhoods are being implemented meeting the challenges of urban structures.

These certification systems contain matrixes of criteria that allow the assignment of points for various aspects of the design's friendliness to residents and the environment, the design is then classified depending on the quantity of assigned

points respectively. Certification creates a 'brand' which can be used for promotional purposes by developers or local authorities. Certification can also be adapted for evaluation of urban designs or their regulations contained in spatial management plans.

The oldest certification system for neighbourhood development is the BREEAM Communities standard developed by the British organisation called the Building Research Establishment <www.breeam.org>. The system originated from the sets of guidelines drafted for municipalities and developers. They evolved later into the 'Code for Sustainable Homes' (DCLG, 2006), and into a comprehensive certification system for new estates and neighbourhoods. The system specifies the following basic indicator groups:

- climate and energy;
- local community;
- placemaking;
- transportation;
- natural resources and ecology;
- sustainable business;
- and buildings.

The system was finally finetuned and implemented in June 2009. Nine designs were selected to test BREEAM Communities, including the London Olympic Village, with a plan of its future transformation into a residential neighbourhood and the MediaCityUK, the new seat for the BBC in Manchester, together with an urban complex providing mixed service-residential-office functions.

The LEED for Neighbourhood Development system, being in the final stages of development, is one of the most recent attempts at developing a comprehensive system that encompasses the variety of sustainable urbanism issues <www.usgbc.org>. The creators of the system were guided primarily by the aim of deterring suburban sprawl, shaping traditional dense urban structures and spaces with mixed uses and diverse housing alongside the promotion of walking, cycling and public transport (Farr, 2008).

The 'Polish Green Building Council' (PLGBC, Polskie Stowarzyszenie Budownictwa Ekologicznego) is responsible for the implementation of a neighbourhood certification system in Poland. Regardless of the certification process, such systems can provide inspiration for urban planning and design, especially since the criteria and guidelines are available free of charge on the LEED and BREEAM websites.

10.5. Summary and conclusions

Urban planning and urban design are interdisciplinary fields that have always required holistic treatment of the various developmental aspects. Taking into account the exceptional complexity, as well as the long-term effects of urbanisation processes, durability and sustainability should be recognised as the basic determinants of the quality of any urban planning and design activities.

Urbanised areas are becoming ever more extensive and complex. For this reason traditional planning becomes inadequate, although necessary. We need new methods of spatial management, urban acupuncture, urban revitalisation programmes, and operational planning. The field of Urban Design integrating spatial, economic, social, aesthetic and environmental factors is undergoing a true revival, and an ever larger role is assigned to landscape architecture. In the free market and liberal democractic conditions all the environment-shaping disciplines require improvement of their applied methods and application tools. Urbanists constantly draw inspiration and knowledge from the past, but their practice is also being increasingly affected by the achievements of environmental psychology and the social sciences.

We referred directly to rural space only in several sections of this Chapter, although a number of the urbanisation issues discussed here apply equally to the countryside as they do urban and suburban space. In view of dispersed, sprawling development almost everywhere, we need higher concentration, densification and creation of compact structures that will provide well-defined urban and rural spaces and stop the sprawl. Consequently, we should recognise that the basic directions of activities include more intense urbanisation of the areas already transformed by humanity, alongside protection of the precious elements of the cultural landscape and protection of the natural identity in other areas.

Practical resources

Programme documents

Charter of European Cities & Towns Towards Sustainability, or the *Aalborg Charter* (1994) <www.ec.europa.eu/environment/urban/pdf/aalborg_charter.pdf>.

The European Urban Charter (1985) <www.sustainable-cities.eu/upload/pdf_files/URBAN_CHARTER_EN.pdf>.

Green Paper on the Urban Environment (1990) <www.ec.europa.eu/environment/urban/pdf/com90218final_en.pdf>.

Istanbul Declaration of Human Settlements (1996) <www.unhabitat.org>.

Charter of the New Urbanism (1996) <www.cnu.org/charter>.

European Spatial Development Perspective (1999) <www.ec.europa.eu/regional_policy/sources/docoffic/official/reports/pdf/sum_en.pdf>.

The European Landscape Convention (2000) <www.conventions.coe.int/Treaty/en/Treaties/html/176.htm>.

The New Charter of Athens: The European Council of Town Planners' Vision for Cities in the 21st century (2003) <www.ceu-ectp.eu/images/files/Athens_Charters/charter2003.pdf>.

Charter of Stockholm: The Charter for European Urbanism (2003) <www.ceunet.org/charter.html>.

Declaration of Viseu: Architectural Education in the 21st Century (2004) <www.ceunet.org/viseu.html>.

Green Cities Declaration (2007) <www.greenercities.co.nz>.

European Charter for Solar Energy in Architecture and Urban Planning (Herzog, 2008) <www.eurosolar.de/en/images/stories/pdf/Herzog_European_Charter_Architecture_mar96.pdf>.

Canons of Sustainable Architecture and Urbanism (2009) <www.cnu.org/canons>.

Oslo Declaration: Climate Change and Urban Design (2009) <www.ceunet.org/oslodeclaration.html>.

The above documents determine the framework conditions for the organisation of sustainable urban communities and the shaping of urban environments. Their role is to promote, encourage, educate and sometimes organise lobbying groups.

One of the most recent Polish programme documents is the *Karta Przestrzeni Publicznej* (Public Space Charter), developed through a series of discussions and conferences dedicated to protection of public space and its shaping, which was finally approved by the Third Congress of Polish Urbanism in Poznań (4–5.09.2009): <www.tup.org.pl/download/2009_0906_KartaPrzestrzeniPublicznej.pdf>.

Other practical resources

Barton, H. (ed.) (2002), *Sustainable communities: the potential for eco-neighbourhoods*, London: Earthscan

Barton, H., Davis, G., Guise, R. (1995), *Sustainable settlements: a guide for planners, designers and developers*, Bristol: Elsevier Science

Brownhill, D., Rao, S. (2002), *A sustainability checklist for developments. A common framework for developers and local authorities*, Watford: BRE

Department of the Environment, Transport and the Regions (1988), *Places, streets and movement*, London: Telford.

Department of the Environment, Transport and the Regions (1999), *By design: urban design in the planning system: a guide to better practice*, London: Telford.

Department of the Environment, Transport and the Regions (2002), *By design: better places to live: companion guide to PPG3*, London: Telford.

English Partnerships, The Housing Corporation (2005), *Urban design compendium*, London: Llewelyn-Davies <www.urbandesigncompendium.co.uk/public/documents/UDC1FULL.pdf>.

Kent County Council (2000), *Kent design: a guide to sustainable development*, Canterbury: KCC.

Project for Public Spaces and the Partnership for the Environment Foundation (2009), *Jak przetworzyć miejsce. Podręcznik kreowania udanych przestrzeni publicznych*, Krakow: FPŚ.

Urban Design Group (2002), *Urban design guidance*, London: Telford.

US Green Building Council (2009), *LEED for neighborhood development rating system pilot version* <www.usgbc.org>.

Questions

1. Is urbanisation threatening the environment?
2. What processes accompany suburban development? Try to identify as many as possible on the basis of the present situation in your country.
3. How can spatial planning influence the costs of urban and rural infrastructure?
4. What forms of urbanisation make the residents less car-dependent?
5. What are the objectives of urban revitalisation? Do you know of any examples of successful and/or failed revitalisation?
6. How can development density and intensity influence contacts between neighbours?
7. Describe the forms and functions of public, semi-public and semi-private spaces.
8. Do we need spatial plans? Why? Can they be replaced or supplemented?
9. Does the village, town or district where you live have clear boundaries? How are they delineated?
10. Are the newly-developed estates well integrated with old districts?
11. How do historical experiences influence present-day urbanism?

Case study 10.C1.
'Old' Nowa Huta

The foundation of a new city called Nowa Huta was a huge social, environmental and economic experiment, developed without common sense, with violation of tradition and of the law, and without considering any of the consequences for the environment (Juchnowicz, 2005, p. 179). Why then are we studying Nowa Huta as an example of sustainable urbanism? What happened in the sixty-year history of this settlement that today enjoys the largest proportion of greenery of all the boroughs in Krakow, being a community that residents identify with, and one that has generated and attracted many social and cultural initiatives?

New city development

The origin of Nowa Huta was closely associated with the decision to construct a large steelworks, with an annual output of about 1.5 million tons of steel. Both developments affected the nature of Krakow and the whole region in way that seemed timeless.

The location fulfilled the required technical conditions, although what finally decided the location were political considerations; primarily, the intention to change the social structure of Krakow. The bourgeois nature of the city was to be neutralised by the neighbouring city for the proletariat designed to house around 100,000 inhabitants. Under this same decision, densely populated villages, with unusually fertile soil and exceptionally rich cultural landscapes were destroyed. Obligatory expropriations were directed mainly at local farmers, with compensations covering only 5–10% of the value of lost houses, fields and forests.

The image that Nowa Huta presents clearly shows the influence of the 'socialist realism' doctrine that dominated between 1949 and 1954 with urban compositions designed to symmetric preferences. Tidy, closed complexes, corresponding to historical settlements, were built and the architectural appearance of individual buildings based on historical patterns. Although the Nowa Huta masterplan made reference to the concepts of an ideal town and the garden city, a clear scheme does not originate exclusively from historical inspirations, but results from the local character and its features. An important element of the Nowa Huta composition is the broad 14-metre bank of the slope of the Vistula (Wisła) valley side. The Central Square was located on the edge of the slope, with five radial streets that determined the main routes and connect the most important districts to the centre. The majority of the routes reflected historical roads, with the Sandomierz road tree stand partly preserved. The landscape composition was based on clear visual axes and the location of key landmarks.

The height zoning was enforced, limiting buildings to two storeys on the outskirts to six in the urban core. The eastern edge was shaped in accordance with the course of the Dłubnia River valley, which constitutes an area of isolated and recreational greenery between the city and the steelworks.

The social conception of the city of Nowa Huta was based on the Anglo-Saxon idea of the neighbourhood unit, grouping a specific number of inhabitants around the elements that shape social bonds. The Nowa Huta designers[2] knew of this concept from its earlier applications, primarily in the New York City regional plan. The designers

[2] Tadeusz Ptaszycki (the head of the group), Stanisław Juchnowicz, Janina Lenczewska, Tadeusz Rembiesa, Bolesław Skrzybalski, succeeded in applying their expertise in one of the most recent and internationally acclaimed patterns, in spite of the political restrictions of the time of its inception.

created four residential complexes, each for about 20,000 residents, and each composed of 3–4 estates for 5000–6000 people. The complexes concentrate on a small area the most important service facilities: retail, restaurants, day care and healthcare. Owing to proximity and a lack of interference from the transportation network, all the facilities are easily accessible to senior citizens and children. The urban blocks and neighbourhood units created a network of well-defined enclosures, such as: squares, streets, parks and courtyards.

Several multi-functional theatres were founded in the new city. Teatr Ludowy (the People's Theatre) was soon recognised by the whole country. Urbanists gave a lot of attention to sports facilities. The masterplan provided for large areas of greenery and garden arrangements, and transplanted more than dozen-year-old trees.

The general opinion is that the construction of the town is a monument of socialism and a symbol of abnormal thinking in those days. Enforced industrialisation and the 'barrack urbanisation' of the first years of the construction period were associated with the breaking of social bonds. Property devastation was common, prostitution and alcoholism were widespread, alongside theft and corruption. However, a large number of new arrivals from villages adjusted themselves supprisingly quickly to urban living conditions. The sizes and forms of neighbourhood units adopted in Nowa Huta were confirmed years later to be justified because they still met the basic needs of the local residents and exert an integrating influence.

During the era of the Polish People's Republic, the residents of Nowa Huta and the steelworks workers proved many times that they had created a community. Their activity was demonstrated during the many years of struggle for the construction of a church, contrary to the objections of the communist authorities. In response to the famous 'defence of the cross', the police used firearms on the 26th of April 1960. Several hundred people were detained and many imprisoned, whilst the consecration of the first Nowa Huta church delayed until 1977. In 1980 and 1988, waves of strikes, demonstrations and street skirmishes afflicted Nowa Huta. The community, together with the steelworks, represented the bravest anti-communist resistance centres in Poland.

Nowa Huta today

Over several decades, Nowa Huta kept expanding, although from the 1960s after implementation of the second phase of building industrialisation, its development was not as harmonious as it was in the beginning. In parallel with the high-rise prefab housing estates erected around the oldest part of the settlement, the population Nowa Huta reached 250,000 whilst the city became the largest borough of Krakow. One can clearly observe here both the ups and downs of mass environmental, social, systemic, cultural, and economic transformations which affected the whole country over the past few decades but focused in Nowa Huta with an unusual intensity.

In the 1990s, the output of the steelworks was drastically reduced and many local businesses collapsed. In total, dozens of thousands of workers lost their jobs. The town was to a large extent bereft of the basis of its existence. What remained were the residents, a polluted environment and a heritage that to outsiders used to symbolise an oppressive system. However, the urban structure and form of Nowa Huta gradually gained appreciation, to a certain extent through the influence of foreign tourism able to see its exceptional qualities. Local patriotism was yet the most significant in overcoming negative stereotypes and reviving the calls for development of the area in the 1990s. A succession of generations of inhabitants strongly identified themselves with the

place and many people pointed out essential advantages of the spatial arrangement of the 'old' part of Nowa Huta, the nature of which was that of a humanised city.

Today, Nowa Huta is known for many social initiatives, although owing to their dispersion, they were of a rather temporary nature. For this reason in 2000 about a dozen organisations and institutions that operated in the borough established an umbrella structure called 'The Forum for Nowa Huta' (FNH). Local authority representatives have been attending the FNH as well. FNH is involved in the creation of friendly public spaces, for example by organising workshops based on the PPS method that we described earlier. Preparing participation in spatial shaping was an objective for the 'Self-portrait Debates' pilot programme which was carried out in Nowa Huta by the Małopolski Instytut Kultury. Their reports highlighted the residents' expectations relating to the neighbourhood space are the outcomes of the debates.

The Norwid Cultural Centre distinguished itself among a number of the Nowa Huta organisations involved in spatial design, the environment, culture, and social relations. In 1992, the Ecological Animation Study was established in the Centre in order to provide knowledge and shape local awareness in the context of global environmental problems. In 1995, the 'Garden City' project was implemented to support urban greenery. In 2003, following the Centre's activities the ecological grounds for the Nowa Huta Meadows were established, encompassing the last well-preserved Vistula meadows in Krakow.

The Norwid Centre coordinated the work carried out by the Partnership for the Nowa Huta Initiatives, where the organisation created among other things the 'Garden of Experiences' which is a sensory educational park. The Centre was also involved in preparations to the Nowa Huta revitalisation project by organising a series of meetings on public space, in co-operation with the Department of Strategy and Urban Development. Lectures and discussions took place on several topics, for example on: recreational space management, the role of NGOs in improvement of quality of life, the place for cultural institutions in revitalisation and economic revival of the borough, the regeneration of the Nowa Huta central axis, and the management of material heritage from the communist era. Eight projects developed in the Centre entered a competition under the 'Local Programme for the Old Nowa Huta Revitalisation'.

Local activists wanted to develop a new and modern image for the town, but also have respect for its historic identity. A film festival dedicated to Nowa Huta attracts thousands of people every year and the Nowa Huta Cultural Centre regularly organises exhibitions of photographs showing the history of the area. The local division of the City of Krakow Historical Museum cares for not only the heritage, but substantively supports community debates, workshops and games dedicated to spatial development.

Nowa Huta is known for its interesting artistic activity, some of which has a clearly social character. Teatr Ludowy has been pioneering in such initiatives for a number of years. The vitality of the area attracts ever more artists and cultural institutions to move to Nowa Huta. Recently, for example the Łaźnia Nowa theatre found its place here, and one of the ArcelorMittal steelworks halls hosts spectacular events confronting industrial-space with classical and experimental music as part of the renowned Sacrum–Profanum Festival.

The idea for development

In the second half of the 1990s, the team led by S. Juchnowicz prepared the 'Study of Spatial Development Conditions and Directions for the Strategic Area of Krakow-East'. The idea was to revive the area which had become either partly derelict or seriously

degraded through industrial activity. The proposed scheme consisted of developing a polycentric system, mainly based on the network of existing railways. After their adaptation for public transport, the stations were to become nodes for developing a multi-functional urban structure integrally connected with the city of Krakow.

Creation of a polycentric structure provides an opportunity for the whole city to attain further spatial development in compliance with the principles of sustainable development; to stop urban sprawl and direct necessary building investments to reclaimed post-industrial land with good infrastructure east of the old centre of Nowa Huta. The proposed urban development scheme took into account the location of the nodal (core) areas and its ecological corridors strictly connected with the ECONET-PL ecological network (Liro, 1995). The Vistula valley consisting of the old river beds, nature reserves and protected-landscape areas provides the basic green backbone of the metropolis. According to a study for the 'Nowa Huta Old Vistula Riverbed Park', the park alongside the ecological grounds of Nowa Huta Meadows combine to provide the elements of a large park system.

Within S. Juchnowicz's concept, these meadows will become the key elements of the Nowa Huta landscape park and owing to their recreational functions and spatial composition will connect harmoniously the urban area with the natural scenery of the Vistula river valley. What remains a challenge is the development of the southern side of the Central Square, which is next to the meadows. That side of the Square could serve as a unique gateway between urban space and open space. Debates on the shape of the Central Square and the main old Nowa Huta axis that starts at the Square, have continued for a number of years and indicate the need for developing a programme on the uses for the Square and the Aleja Róż Avenue, to enrich and focus the life of the Nowa Huta community. The 'Local Revitalisation Programme' provided for such activities, although a specific concept is still to be chosen through a design competition.

In the sixty years since Nowa Huta was established and after twenty years of economic and political transformations, there is little to remind us of the Stalinist origin of Nowa Huta. Well-designed social infrastructure and an integrated townscape created good conditions for the shaping and development of local communities. Today, Nowa Huta is the greenest borough of Krakow, both literally and symbolically.

Questions

1. What were the consequences of the application of the neighbourhood unit concept in the Nowa Huta masterplan?
2. What is the significance of the tradition of an area for social integration?

Case study 10.C1.
Siewierz eco-town

The idea for a garden city has been described before as a concept that has more than one hundred years of history, although still seeming to be a viable solution if the conditions for mixed uses and the provision of good transportation links can be fulfilled. In that spirit, a design for the new Siewierz eco-town was created as a compact urban arrangement to ensure good access to infrastructure, comforts characteristic of towns, concentrated services and other economic activities, whilst offering contact with nature, privacy and small-town community type (figure 10.9).

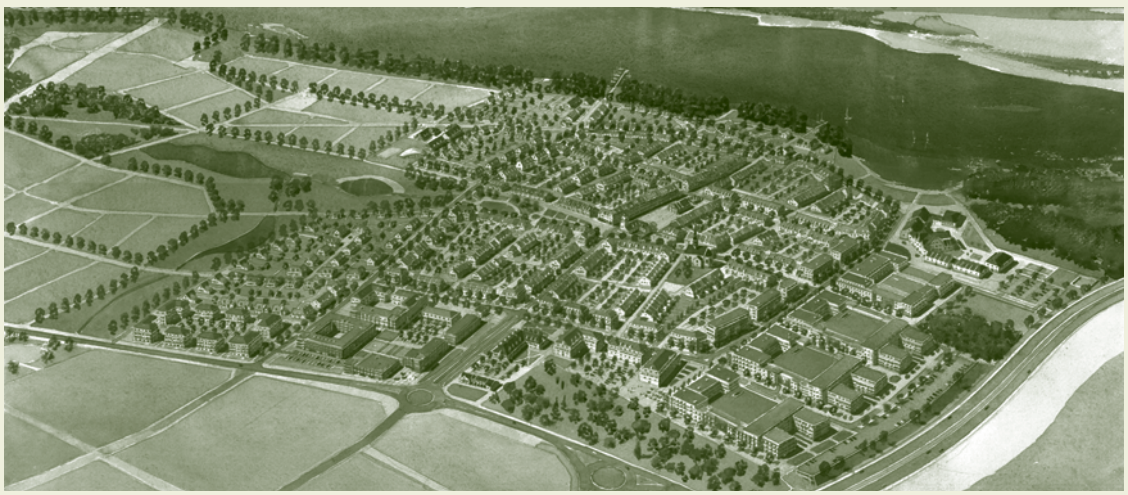


Figure 10.9. Siewierz eco-town: visualisation of the project, © MAU

The Siewierz eco-town is an initiative of the TUP SA company which had been offered land for development. Initially, the construction of a regional logistic centre was considered. The site was located close to Siewierz, a small town with a very rich history, and near to the Upper Silesian metropolis and the Katowice-Pyrzowice airport, which is also on the Katowice–Warsaw route (National Road No. 1). The area has also has other advantages: the land is beautiful and undeveloped, located directly by the Przeczycko-Siewierski artificial lake, adjacent to the Jura Krakowsko-Częstochowska landscape park, and lies along the newly designed railway line connecting Katowice with the airport.

As a result of previous interest on the part of investors, the municipality of Siewierz decided to change the 'Study of Spatial Development Conditions and Directions' and prepare a 'Local Spatial Management Plan' for the land. However, the ambitious new town development proposal presented by TUP SA was not immediately accepted or supported by the town authorities.

The investors commissioned the design of the new town from Mycielski Architecture & Urbanism (MAU), a consultancy specialising in the sustainable urbanism projects. MAU prepared and organised a *Charrette* workshop (described as one of the 10.T3 tools). During a several-day long workshop in October 2007 it was possible to establish a vision for the new settlement and start or strengthen co-operation with the majority of people and institutions that were necessary for the project's success. What was crucial was that the Mayor of Siewierz was determined to find optimum solutions for community development and that other community's officials were open to collaboration.

During the workshop, all the stakeholders and consultants demonstrated substantive preparation, and the appreciation of the project increased gradually in the community.

Figure 10.10. The central square of Siewierz, © MAU

The spatial arrangement proposed by an international group of urban designers, with the essential participation of local stakeholders, assumed the construction of a compact town, with services, offices, hotels, a marina, a local water intake facility and a wastewater treatment plant. Considerable stress was placed on the application of environmentally-friendly solutions. The construction of several energy self-sufficient housing estates was concentrated around town squares (figure 10.10), with the church intended to be a spatially dominant feature. In the central part of the scheme, a park with a network of ponds and water holes is provided. A recreational zone, with a hotel and a large conference complex, hotel, marina and pier were planned for the strip of land along the lake shore, whilst an arrangement of industrial and office structures along National Road No. 1 would screen off the residential and service areas from the arduousness of intense traffic.

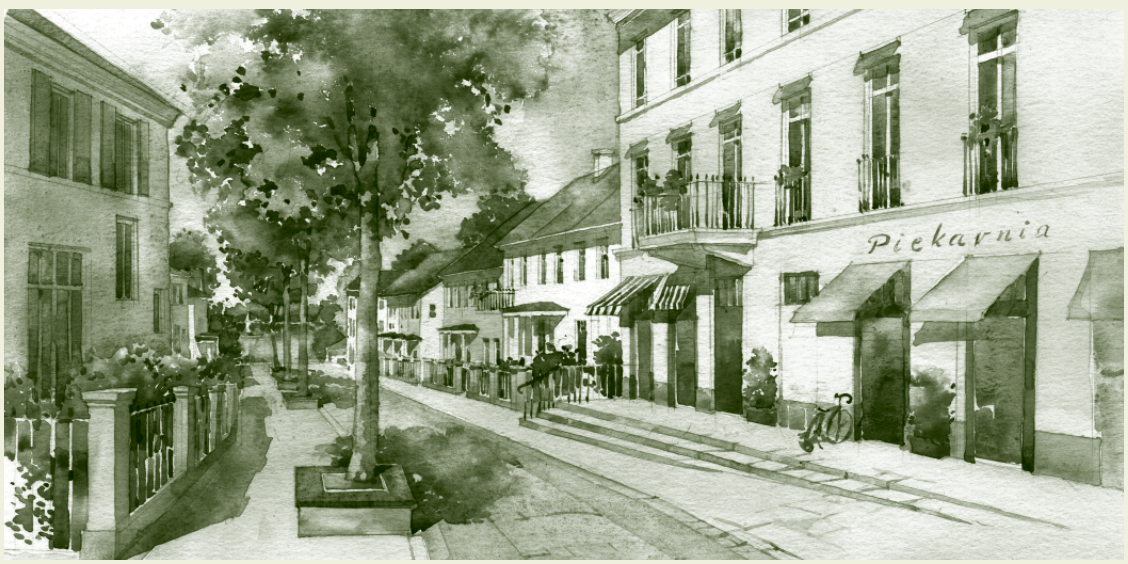


Figure 10.11. A street of the newly-designed town, © MAU

The development is intended to be constructed gradually. Two years after the *Charrette*, the Study was finally approved and the Local Spatial Plan prepared. Environmentally friendly solutions have been supported by an architectural code (tool 10.T2), prepared by the DPZ Europe team. A complete Business Plan was prepared by the New Broad Street Companies from Orlando, known for example for the development of Celebration and Baldwyn Park, two most acclaimed new towns in the spirit of New Urbanism.

The new Siewierz is to be constructed in several stages, with a target population of 7000 people on 120 ha. The first district will occupy 44 ha, and will contain 1000 flats and houses and about 60–90,000 m^2 of office, hotel and other types of service space. The settlement density, which is much higher than the Polish average, together with functions and technologies that are environmentally friendly, justified the greenfield occupancy.

However, not all problems that have resuled from a lack of proper legal instruments and a lack of local experience in the completion of such projects have been resolved. The design does provide for the application of planning mechanisms and tools that are well proven in the United States or the United Kingdom. In Poland, under the terms of imperfect legal requirements intended to guarantee performance compliance in design, implementing the agreed architectural code will be a challenge. Such compliance will decide the cohesion, compactness and harmony of buildings, mix of uses, the mobility hierarchies, and the proper shape and furniture of public spaces (figure 10.11). The code is supposed to guarantee the application of wholesome, local materials, harmony of colours and details, ecological water and wastewater management in all households, and renewable energy supply etc.

In 2009 the situation in the real-estate market was not favourable to the implementation of ambitious plans, while the Siewierz eco-town remains a commercial project. All the stakeholders agree, however, that taking into account the space and quality of life to be offered by the new Siewierz, the project will not have competition at least on the regional scale. The density of the settlement is far from the ideal assumed for inner-city areas, but still it stands out in comparison to the suburban areas developed in recent years in Poland. The introduction of commercial functions complements the residential ones, reduces distances and guarantees vitality of the space. At the same time, some of the project's priorities are in close contact with nature with a high quality of public and semi-private spaces that favour social integration.

The project has been well prepared, although new obstacles can be expected during construction. What is of key importance is to stimulate interest with investors and assure the stability of municipal policies during the entire construction period which could take many years. If the plans are successfully implemented, a present-day version of a garden city neighbourhood will be achieved that combines historical ideas and traditional form with up-to-date principles of sustainable development and technologies.

Questions

1. What arguments can be used to persuade a private developer to organise design workshops?
2. How significant for the method of implementation of a new project is the preparation of an architectural code?

Chapter 11.

Urban transport

11.1. Introduction

'Bob Dylan was arrested. Someone had called, the police came and took him of the street. They didn't recognise with whom they dealt. A mysterious man had been walking the street in a small seaside town in Jew Jersey and looking for something. In addition to this the man was walking in the rain, so he must have had some ignoble intention. What is more, he was looking into a courtyard of a house with a plate "for sale". And what a wanderer (this is how the pedestrians are called in a highly industrialised countries) would like to buy a house if he can't even afford such a basic commodity as a car' (*Przekrój*, 27.08.2009, p. 58).

Is the world where only the wanderers walk and a car is an indicator of a social position a dystopia of the 21st century, or is it rather an embarrassing heritage of the 20th century waiting to be overthrown in a next 'transport revolution'? In search for an answer to this question we take the perspective of decades' of experience and examine the phenomena that gave birth to the concept of sustainable mobility. We analyse the role of transport in the functioning of a city and try to identify the barriers that transformed the transport system from a tool for the city's development into a source of structural problems. We evaluate the role of 'hard' infrastructure as well as that of 'soft' organisational change in order to finally work through the circumstances in which decisions that determine the shape of the transport system are taken. All through the chapter we refer to the ideas discussed in the previous chapter as the efficiency of transport depends not only directly on the quality of urban planning, but in itself determines the way a cityscape is shaped.

Moreover, we present three tools stimulating sustainable mobility, one each for the bicycle, the public, and the car. We also discuss whether the concepts of sustainable mobility can be successfully implemented in Poland, based on two case studies, of particular transport solutions (the Śląsko-Dąbrowski Bridge in Warsaw, case study 11.C2) and of the concept of sustainable mobility applied at the whole city scale (the transport system in Krakow, case study 11.C1).

11.2. Sustainable mobility – the birth of an idea

11.2.1. Transport as a stimulus of a city development and downfall

In the public debate the issues of sustainable transport are often reduced to the problem of harmful emissions. However, even though transport is indeed a significant producer of the pollution,[1] this is not the direct negative environmental effect that gave birth to the 'transport revolution' nor has it been the key reason for its development. Shaping the rules of sustainable mobility began more than fifty years ago, and contrary to most other areas of sustainability, it was based on resistance to destruction of the historical cityscape and its fabric, not environmental deterioration.

[1] For example, in the EU in 2007 the share of transport in total emission was 45% of nitrogen oxides, 38% of carbon oxide and 18–21% of particulate matter pollution (EEA, 2009, annex A).

The history of transport development is closely related to the development of cities. Transformation of city structure resulted from the inventions that improved mobility (see chapter 10). Newman (2007) indicated three main phases in this context: a walking city (before 1850), a transit city (for the next 100 years) and a car city (since 1950). The walking city developed before the industrial revolution, when the distances between the most important points in the city were short enough to be reached on foot. The transit city grew significantly, but still it created the belts of settlement in that urbanised areas spread along the transit lines (railway and tramway, sometimes also bus routes) used to reach the city centre. The car city broke the barriers of this linear development and sprawled along the huge areas between the transit lines and beyond them. Of course, these processes occurred with a different intensity in different countries, in different times and indeed, they often coexisted and mixed. Thus, even Newman (2007) suggested that a contemporary city is almost always partially each of those types described above.

The mass production of cars that originated in the United States at the beginning of the 20th century marked a turning point in the history of transport. The invention of the assembly line first used in Ford's factory enabled the car producers to supply the market with such large numbers of cars that no more than 30 years were needed to statistically make each American family own a car (in Poland in that time there was one car for every 1400 people). The unlimited mobility brought about by the high supply of cars in a short time caused enormous spatial growth of American cities, giving birth to huge residential areas in the suburbs, where people 'ran away' from the polluted city centres. The process was supplied by the town planners of the time, who were struggling to create a vision of the city in which all the problems of the 19th century could be overcome. The car seemed to provide unlimited possibilities of movement in which distance would not play a significant role any more, so the need for concentrating city functions on a limited area was no longer taken into account. The city of modernism was to be composed of detached buildings standing in the greenery linked by modern parkways. This occurred so quickly that in practice the highways needed constant extensions, which in some of the American cities almost led to the disappearance of the city centre. New lanes of extended roads and car parks covered most of the land where the buildings used to stand and most of their functions were moved to shopping malls (see the example of Detroit later in the chapter).

Although less pronounced, the fascination with the car was also evident in Western Europe. However, by the 1960s when the first voices contesting the modernist's vision of the city appeared they met with understanding and support. The Old Continent boasting of its centuries of tradition was much more sceptical of the proposed mass demolition and drastic transformation of the city structures. It was also quickly realised that wide roads and broad spaces in the city did not automatically guarantee a high standard of living. A different situation took place in Eastern Europe, where 'modern' wide lanes and thorough rebuilding of the cities became the icons of the post-war socio-economic order. Paradoxically, the vision of the city cut by the new highways built on the debris of the old fabric was deeply engraved in people's minds. Even after the political transformation, this is still recalled in public debate as an archetype of modern transport.

The first small pedestrian precincts appeared in the 1960s in the historical centres of British cities. They were still intended to be accessed mainly by car, thus creating a pedestrian area was often supported by creating a motorway ring-road around it. However, from the perspective of further changes, these solutions already indicated a

trade-off between full access to the city for individual motorists whilst keeping the urban fabric and structure. Over the next half of century this concept evolved under the influence of disputes over the freedom of movement, the free market and the permitted as well as real involvement of public funds in transport. At the same time, regardless of these discussions, some countries (especially the Germanic ones) were developing their public transport, never allowing public transport to loose its significance, whereas in some other countries, especially in the Netherlands, the bicycle maintained its position (tool 11.T1). A combination of both negative and positive experiences in various countries led to what nowadays we describe as sustainable mobility.

Tool 11.T1.
A public bicycle

A system of shared bicycles at first glance seems to be a pure utopia. Although just as in the self-service markets shop-lifting is insignificant and the toilet paper in public toilets is not stolen[2] because it may simply be bought in a shop, the bicycles left in a public space to freely use with a little oversight remain where they are to become a well-functioning element of the transport system.

The first system for public bicycles appeared in the 1960s in Amsterdam, the city in which a bicycle use was already traditionally very high (Wesołowski, 2008). The next attempts at this took place in different places and at different time intervals. In 1975, 350 bicycles were offered to the citizens at three sites in La Rochelle (France). Five years later, the authorities of Finnish Joensuu bought 200 bicycles, painted them yellow and left them in the city for free use, but even in Finland, with its well-known low crime rate, the vehicles were still stolen.

These first attempts had many contradictions. While the bicycles were intended to be shared freely, what was the guarantee that for example after doing shopping we would still have a bicycle outside to ride when we came back? How to combine the planned full accessibility with the fact that there were only a few rental points? And as it was necessary to hire a bicycle for a longer period, why would one not just buy a bicycle for oneself, better customised to one's own needs and likings? And finally, how to protect the bike from being stolen if according to the rules anyone was allowed to take it?

Nevertheless, after a few trials the idea crystallised into a logical approach. It was understood that a key factor was the huge number of vehicles gathered in a limited area. One of the first successful attempts was the public bicycle in Copenhagen (established in 1995), where the area for free use of the bicycles was limited and where a symbolic deposit was introduced, similar to that used with shopping trolleys. However, a true breakthrough was achieved by the widespread use of electronic cards. In contemporary community bicycle systems, in a docking point, a deposit would be paid by a credit card to collect a chip card that identified the user and let them take the bicycle. If the bicycle is not given back the deposit will not be returned, and in some of the systems, the payment is also taken from the deposit depending on rental time. To secure the proper rotation of the bicycles and encourage people to return them as soon as

[2] The idea is not as absurd as it seems; as a result of shortage in supply of this prosaic article that occurred during the communist period in Poland, toilet paper was sometimes embezzled from public toilets if not by the users, then by the staff.

possible, the first period (for example half an hour) may be free of charge, whereas longer use requires payment. Based on such simple rules, in Paris a system has grown to become the biggest public bicycle system in Europe, with 1400 docking points and 10,000 bicycles. In Poland, a public bicycle system was introduced in Krakow with 100 bicycles and 12 docking points.

A public bicycle has its own niche, so it is no coincidence that it became so popular in Paris, a huge metropolis that because of its size seemed completely inadequate for cycling. A shared bicycle works best if it is used only to make part of the journey. A well-organised system lets the user move freely in the main area of the city (a typical asset for individual transport), but as a public transport it provides also a rotation of the users and thus reduces the amount of space taken up. A typical use will be then coming to the centre by rail or even by car, but in the centre when travelling short distances, a shared bicycle is used. The threshold for the service appears to be the extent of the network of docking points.

11.2.2. External costs of transport

The main reason for the existence of cities is the concentration of people, goods and activities in a limited area. This concentration makes economic and social activities easier, because the time that is needed to exchange commodities and thoughts is shortened. Porta and Latora (2007, p. 101) summarised this as: 'centrality is a key factor in shaping both urban space and urban life', which means that efficient transport warrants the functioning of cities. But what does 'efficient' really mean?

Newman (2007) suggested that everyone has a travel time budget limited to approximately one hour a day. For at least 600 years the cities have been developing to enable travelling within that time limit. As we noted before, it used to be thought that the car would overcome the barriers put up by the travelling time budget. The example of Birmingham shows how this worked in practice. In 1960, aiming at improving transport accessibility, a new motorway was built around the city centre. However, no more than 20 years were needed for the road to become completely congested, which isolated the city centre from the rest of the city, generating noise and pollution, and resulting in depopulation and deterioration of the area. To overcome this, in the 1990s the city centre was turned into a pedestrian precinct and part of the motorway was finally torn down (Low, 2007).

The point is that the road infrastructure for the car transport demands so much land that even a very complex infrastructure serving an area does not guarantee efficient travelling when transport relies fully on the car. Moreover, the supply and domination of road transport infrastructure will result in a growth of demand, thwarting the benefits associated with constructing new roads (Goodwin, 2007; Wesołowski, 2008).[3] The mechanism for this process is shown in figure 11.1. Building new roads enlarges the total capacity of the transport system and makes driving faster and more smooth (balancing loop B1). The shrinking travelling time makes car use more attractive. While roads become easier to use, the car is used more often and the travelling distance increases (balancing loop B2), for example in driving to supermarket on the outskirts, instead of going to shops in the neighbourhood. Although the average travel time rises, more people buy cars, lured by the previous image, and consequently give up travelling

[3] Traffic that is a result of a higher supply of a transport infrastructure is also called induced traffic.

by public transport (reinforcing loop R1). This results in growth in traffic, while the income for public transport companies falls and thus the quality of service (reinforcing loop R2). The poor quality of service makes the attractiveness of car use increase. At this point, the situation becomes a downward spiral for mass transportation, whilst the initial benefits gained from the building of new roads are thwarted by a growth in traffic.

As in case of Birmingham, increasing traffic is followed by deterioration of the environment and a number of social problems, such as traffic accidents[4] and increases in illnesses. For instance, it has been proven that people living in car-dependent areas in America are more likely to suffer from obesity or illnesses of circulatory system, as a result of a lack of physical activity. A similar phenomenon was observed in Johannesburg, where car use is also connected with ensuring personal safety. Emptying public space generates rising crime, and 'pushes' the next social group into the car (Low, 2007).

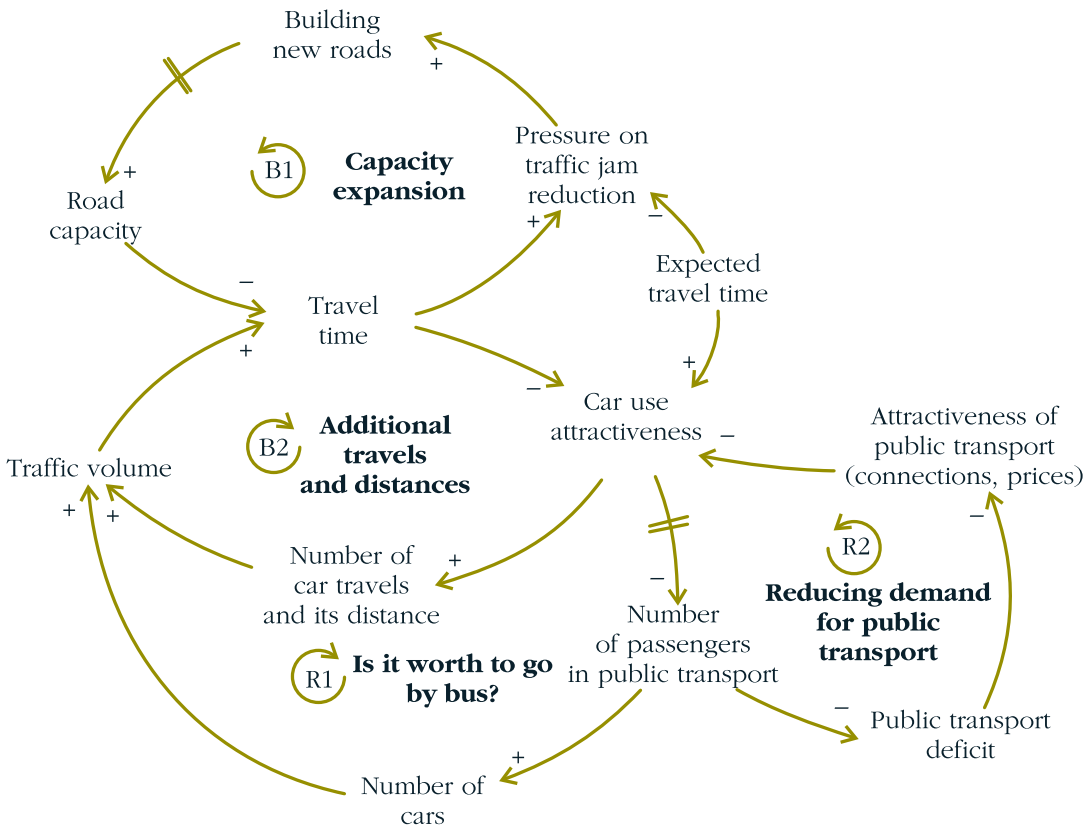


Figure 11.1. Downward spiral of mass transportation – why building new roads does not provide the expected results? (adapted by Piotr Magnuszewski from Sterman, 2000, pp. 177–188)

Why is that we do not regard all the processes described as a natural matter that simply happens and has to be tolerated as a part of economic development? To answer this question, we have to examine the externalities of transport (see section 1.3). Crime raises expenditure on the police and court maintenance, as well as the rehabilitation of criminals. Illnesses and accidents raise expenditure on healthcare that is finally covered by insurance funds and the national budget. The costs of building and maintaining roads are obvious, but they also entail less obvious costs related to excluding the terrain covered by road infrastructure from other, more profitable uses (the alternative cost).

[4] In Poland in 2008, 5437 people were killed and 62,097 were injured in car accidents (Symon, 2009, p. 7).

Similarly, the cost of degradation of public space eliminates from the city area those activities that require a high quality of public space. Environmental pollution also generates costs. This implies a reduced standard of living that weakens the competitiveness of the affected city, in comparison with other cities. Additionally, higher expenditure is necessary on maintenance of buildings, infrastructure, and on cultural and natural heritage damaged by pollution. Treating people affected by pollution and noise is yet another expenditure related to transport. What all these costs have in common is that they are not covered by those who cause them, but are transferred onto other actors, the city's inhabitants, companies, and taxation system.

How then can mobility be sustainable? In spite of the fact that we have discussed extensively the impacts of car use, sustainable mobility should not in any way be interpreted as not using or not having cars. Moreover, we would not call sustainable a system in which all the external costs are just covered fully by those who create them. Finally, neither will a system be sustainable where all the journeys are only made on foot, even though this is almost neutral for the environment. The essence of this matter was expressed well by Gudmundsson (2004, p. 42), in writing that transport is not isolated from the society and that the 'sustainability of transport systems should in fact be considered as part of changes in the whole socio-economic system'. The purpose then of sustainable mobility is to secure the possibility for movement and to make it optimal without limitation. However, a key condition is that all the negative phenomena and all costs caused by transport should be lower than the benefits that transport brings to the urban socio-economic system.

Tool 11.T2.
Restricting car traffic

Introducing a sustainable mobility should rely on the 'push & pull' approach (Verhoef et al., 2008; Wesołowski, 2008), which means that at the same time we restrict using those means of transport with the highest external costs and we promote the attractive alternative of a city-friendly transport. Below, we describe some of the possible ways of 'pushing' individual cars out of the city. The examples also illustrate the ways of internalising the external costs connected with transport and their prevention (see tool 1.T2).

A solution that became broadly renowned was the introduction in 2003 of a congestion charge for the people driving a car into the centre of London.[5] It evoked both a fierce discussion and attempts to implement similar solutions in other cities. In Stockholm, after a few months of trial operation and a citizens' decision made via a referendum, a toll was also introduced in 2007. In 2008, a charge based on car emissions was initiated in Milan and similarly in a few German cities. However, since 1975, the first such solution already existed in Singapore (Wesołowski, 2003, p. 231). This was followed in Oslo where a congestion charge was established in the 1990s. The possibility of implementing tolls has also being considered in Zagreb, New York and Warsaw among others, however these proposals usually face strong resistance from the public.

Even more radical but occasionally used is rotational prohibition from entering the city by car. This is sometimes used by cities endangered by heavy smog (which

[5] The practical aspects for using the system are described on the website of Transport for London <www.tfl.gov.uk>.

was the case in Beijing during the 2008 Olympic Games) or other nuisances. This usually means not allowing cars with either even or odd numbered registration plates to enter the city on even or odd days of the week or month. Nevertheless, such solutions are interventionist and not of a system character. For this reason they result only in temporary elimination of random users rather than permanently discouraging them from urban car use.

One possible system solution is reducing the number of cars by rising the vehicle occupancy rate. As an example, the systems of car sharing and car pooling offer a possibility to transporting other passengers while driving a regular (or planned in advance) route. This is another example of replacing products with services, the strategy to which we referred to in chapter 8. In Anglo-American countries, that are long used to driving, car sharing and car pooling has been encouraged through specially dedicated high occupancy vehicle lanes that can only be used by cars that carry two or more passengers.

What may be regarded as the most effective and durable solution, is reducing traffic through its proper organisation. This is a relatively difficult task as it demands customising solutions to the city structure, and sometimes rebuilding it. Proper traffic organisation requires defining a road and parking capacity threshold that will not overload the system. If organised in this way the system allows for a certain number of users who are definitely interested in car use to enter the area whilst maintaining its multifunctional character. One of the key steps in reducing car traffic is eliminating transit traffic from the area (usually the city centre most exposed to the negative effects of traffic). It may be achieved through shaping the road system in a way that makes crossing the area so difficult[6] that the drivers prefer to use bypasses. Sometimes it is enough to make driving across the centre not possible in a straight line, by separating areas by pedestrian streets (Rudnicki et al., 2005)

The next step is calming traffic using physical barriers, such as speed bumps, small roundabouts, and curb extensions. The last step is pedestrian precincts, where driving is not allowed, taking into consideration local conditions and needs where the ban might not apply through the whole day and exempt certain vehicles, for example those of residents, deliveries, and services. A tool that supports reducing traffic is a parking policy that not only means toll-collecting but also reduces permitted parking time and finally reduces the number of parking spaces including those on private lots.[7] In practice, alongside organising the traffic, all of the elements mentioned above are already in use, and sometimes these complex systems can be broadened relatively easily to adjacent areas.

11.3. Transport as an integrated system

The transport system is a 'coordinated, integrative mechanism for ensuring urban accessibility' (Low, 2007, p. 135). The main aim that shapes the system is putting into practice the transport solutions that bring about on the scale of the city, lower costs but demand a higher level of organisation (tool 11.T2). Without such shaping of the system, mass transit is displaced by the individual transport, and physical activity (walking and cycling)

[6] Or simply unfeasible; one of the pioneering solutions was dividing the city centre of Gothenburg as early as the 1960s into five zones each of which were to be freely accessible, but impossible to drive directly from one zone to another (Wesołowski, 2003, p. 231).
[7] For example, in Copenhagen over a period of 30 years the number of parking spaces was reduced each year by 2%, whereas infrastructure for pedestrians and cyclists was created in their place (Newman, 2007, p. 92). Wesołowski (2003) quoted that in the centre of Basel for one flat smaller than 140 square metres there might be no more than one parking place, whereas in the case of public buildings the limit is one place for seven workers with no spaces for visitors.

is pushed aside by motor-powered transport. These changes are made without any particular and conscious choice, but are the result of small steps and minor neglects (often described as the tyranny of small decisions, see section 14.2). That is why managing a sustainable transport system is a task not for particular residents, but for local authorities which cannot be restricted to the municipal ownership of companies serving the system. Low (2007, p. 147) asserted in this regards that it is the authorities' task to 'steer rather than row'.

11.3.1. Substitution, competition, coexistence – the role and capacities of different means of transport in the system

There are four main means of urban transport. Each of them becomes optimal in certain situations, but to a large extent they are all substitutable. Walking causes almost no external costs. The next in the hierarchy is cycling, which does cause some accidents, but still does not discharge any pollution during use. Mass public transport[8] is characterised by a relatively low pollution and accident rate per passenger, as well as by very low spatial occupancy rate which results from a high occupancy and rotation of vehicles. The last in the hierarchy is individual motor transport (mainly the car), with the highest external cost per passenger (figure 11.2, and also figure 1.2).

Figure 11.2. Means of urban transport – external costs versus the intended priority in traffic (adapted from Low, 2007)

The efficiency of use for each means of transport results first of all from the distance to be covered and the popularity of the route among the passengers. Both these features are consequences of land-use intensity, because the more inhabitants there are and the more economic activity there is in an area, the higher the travel rate and the smaller the mean distances. The means that are generally slower become more popular where land-use intensity is higher.[9] Efficient public transport is said to be popular where the intensity reaches 3500–5000 people per square kilometre, for the bicycle transport this is 5000 people per square kilometre and the lowest threshold, whereas efficient walking-based moving denotes twice this number (Newman, 2007, p. 90).

[8] This includes mostly railway, tram, bus, trolleybus and similar vehicles of different capacity and drive as well as some intermediate forms between these means.
[9] Land-use intensity is regarded as a combined indicator of the number of inhabitants and workers in the area.

However, we should remember that in general, in normal conditions, we limit the travelling time budget to one hour a day. In practice however we very often exceed this limit. As a result, people tend to find uses for the extra time they spend travelling. For instance, utility cycling may be regarded also as a recreational activity. While travelling by public transport, we can read a paper or a book, listen to the music, learn, in some situations even eat a meal or have some sleep. The opportunity to use the travelling time productively depends mainly on travelling conditions, making them equally important as the travelling time itself. In some cases, travelling by car results in the opposite situation, while instead of walking we drive a car to 'save time' we then need to spend our free time on some additional physical activity (Low, 2007, p. 136).

To make a choice between the means of transport really free, some threshold conditions have to be met. Pedestrians and cyclists are the most vulnerable to road accidents and crime, so the key issue in their case is to provide people with personal safety. Stimulating walking requires first and foremost the creation of a public space of proper quality. It is worth noting that safety of the users does not exclude coexistence of cars and pedestrians in one shared space providing the road design limits speed and protects pedestrians from excessive traffic. Similarly, a fully 'safe' subway passage, in theory created to protect pedestrians from car accidents, in practice often presents mainly a barrier for the disabled and a substandard space blighted by crime. Furthermore, these are quite often built in places where surface crossing might also easily have been created (Wesołowski, 2003).

Utility cycling requires preventing accidents between cyclists and cars which means creating traffic engineering solutions that reduce the number of collisions with heavier vehicles. Principally, this means a well designed system of bicycle lanes, solutions giving the cyclists priority ahead of cars, and alternative routes dedicated to bicycles only. Suitable infrastructure can make a bicycle an important means of transport even in the harsh climatic condition of the Nordic countries (figure 11.3).

Figure 11.3. Bicycle parking area by the buildings of the University of Joensuu (Finland) in the wintertime

Other issues play a key role in public transport, which is first and foremost expected to provide passengers with sufficient speed. However, what plays another key role is not the maximum speed of the vehicle itself, but the average speed from door-to-door and the total time in travel. The important components are then access to the station or stop, waiting for the vehicle and paying for the journey, the ride itself, transfers (access to the platform and waiting) and the walk from the stop to the final destination (see tool 11.T3). Improvement in public transport may concern each of these components but from the point of view of passengers, how travel can be made faster is not the most significant factor.[10]

The last of the means of transport above is the individual car and although most of the cities that put the concept of sustainable mobility into practice try to reduce the car use, 'the car is fundamentally not a city vehicle' (Low, 2007, p. 134), in some cases its use is optimal, but only just acceptable in others. These situations apply mainly to situations where organising public transport for an area is too expensive or unnecessary, such as occurs in sparsely populated suburbs or on unpopular routes.

We have already mentioned that various means of transport in many cases may replace one another. As Goodwin (2007, p. 420) noted even 'soft' actions that do not change the properties of travel itself, such as the promotion of public transport and healthy lifestyles or home shopping are able to reduce the car traffic by up to 20% during peak hours. To understand how broad the potential is for each means of transport, we shall now follow a modal split describing their use in four model case cities.

Detroit, the cradle of American motorisation, is a city regarded as a model case of a decline of the traditional city under pressure from individual motor transport. Historical fabric was replaced by islands of sparsely built-up skyscrapers, surrounded by roads and parking lots. The city lost a half of the inhabitants, and one third of the city area lies empty, and 32% of inhabitants live bellow the poverty line (Wesołowski, 2003, pp. 196–197). The city is well known for its high crime rate in the city centre, with suburbs spreading for tens of kilometres, and one of the biggest traffic jams in the United States. As shown figure 11.4, 94% of the journeys in Detroit were made by car and the remainder equally divided between public transport and walking. The opposite situation is found in Tokyo where in spite of a network of urban motorways, public transport (mainly a well-developed network of urban railway and underground) served 84% of transport in the 1980s. In Tokyo the car took only a 6% share and the city kept a very concentrated structure. The use non-motorised transport plays a bigger role in the smaller cities, although the range of possibilities remains very wide. In Basel (Switzerland), where sustainable mobility guidelines are followed seriously, almost half of journeys are made on foot or by bicycle and with the share of public transport also significant. But in Strasbourg (France), before a modern tram network was opened in 1994, the percentage of non-motorised journeys was only about 15% with 70% of journeys taken by car.[11]

[10] For instance, high accessibility was the main reason for the renaissance of the tramways since the 1990s, in spite of lower speed of the tram compared to a railway.

[11] After building the tram system and creating pedestrian precincts in the centre the share of car journeys fell to 50% in 2000 (Kirkham, 2002, p. 3-17).

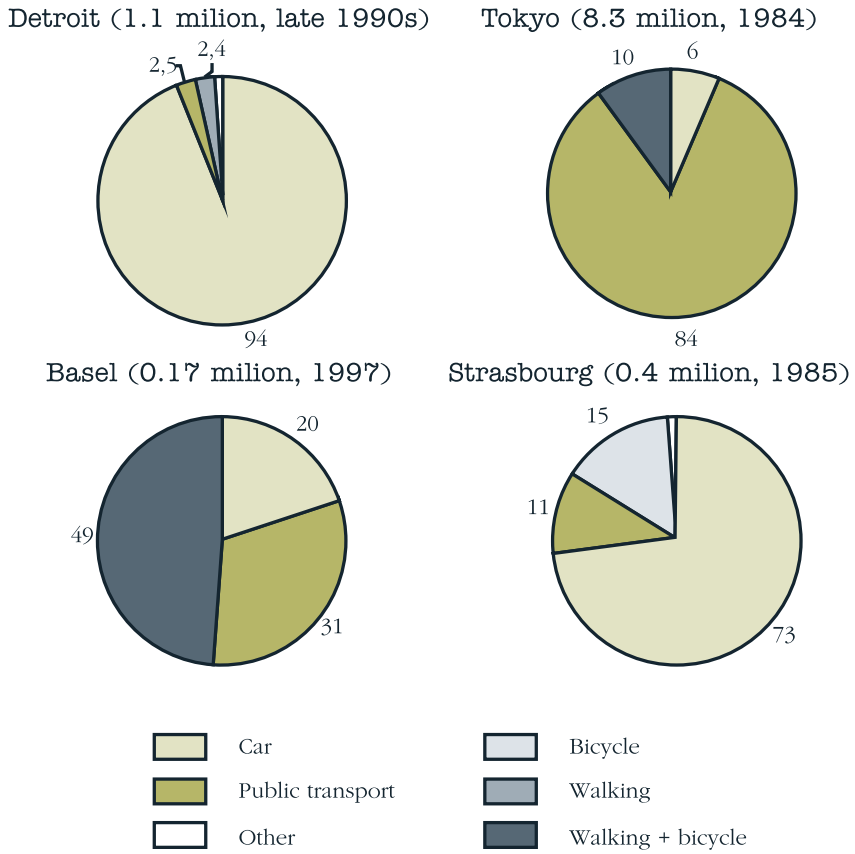


Figure 11.4. Modal split of journeys made in selected cities (adapted from Wesołowski, 2003, pp. 324–325)

The above examples represent the most developed countries and show that the scope of the possible scenarios range from full car-dependence to marginal use of the car at a whole city scale. Moreover, the choice between the means of transport does not have to depend on a person's income (Newman, 2007). The way the city is served in terms of transport remains mainly an outcome of political decisions. It should be remembered that this choice entails consequences for the entire city and that the modal structure is typically characterised by a huge inertia. The changes in transport behaviour proceed gradually and time and incentives are needed to adapt to changing conditions (Goodwin, 2007).

Tool 11.T3.
Integrated transfer junctions

Usually, organising transfer points for public transport demands investment in infrastructure, however in many cases this may be achieved with relatively low expenditure. Such junctions enable the significant reduction of travel times without any major technological changes, so the relation of cost to benefits remains favourable. What is also important is that the changes are made at the point of the journey where the passenger cannot use their time for any other activity (figure 11.5).

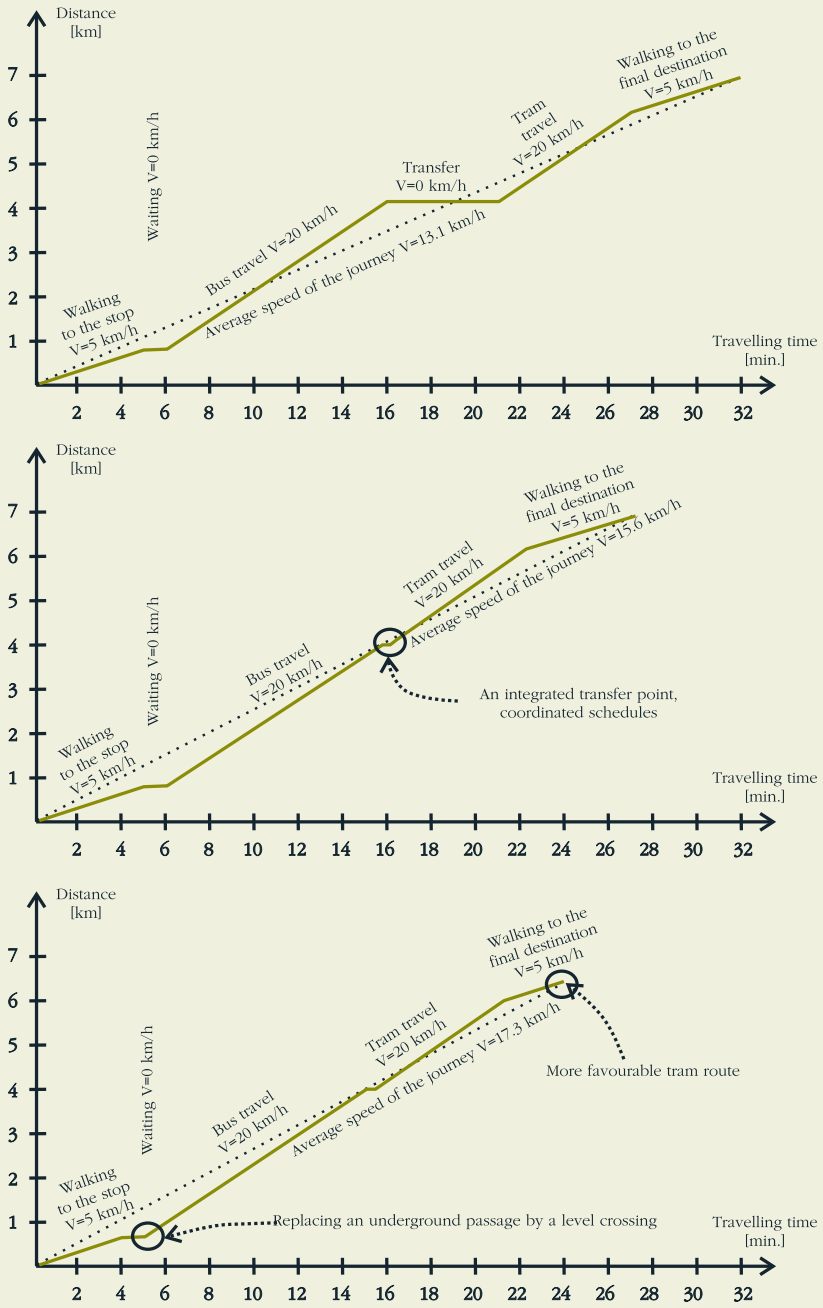


Figure 11.5. Components of a hypothetical travel by public transport and exemplary possibilities for reducing travel times

The time needed to transfer may be reduced even to a dozen seconds or so. Convenient transfer points at different scales are built into major city junctions with an ideal situation of being able to transfer from a single platform (figure 11.6). This solution in its simplest form is used particularly to link feeder buses with a rail or tram network. If buses or other means of transport serving a given junction are not run frequently the schedules have to be coordinated with services waiting for each other. In the case of major junctions, the bigger problem is to reserve enough space for platforms. On the other hand these are key points in the city, and are there to ensure a better transport. In order to provide appropriate comfort, platforms are usually roofed and the junction facilitated by basic infrastructure, such as ticket selling machines, kiosks, and information tables. The junction should be designed to minimise the distance walked during a transfer and due to the very high number of users the walking routes should not be crossed by any road with car traffic (figure 11.7). Similar needs may be identified in the case of railway junction stations, as they are at airport hubs. The main difference is that they are bigger and sometimes different parts of the junction serve different terminals.

Figure 11.6. Mainz (Germany) – a transfer from a feeder bus into the tramway which takes place within a single roofed platform

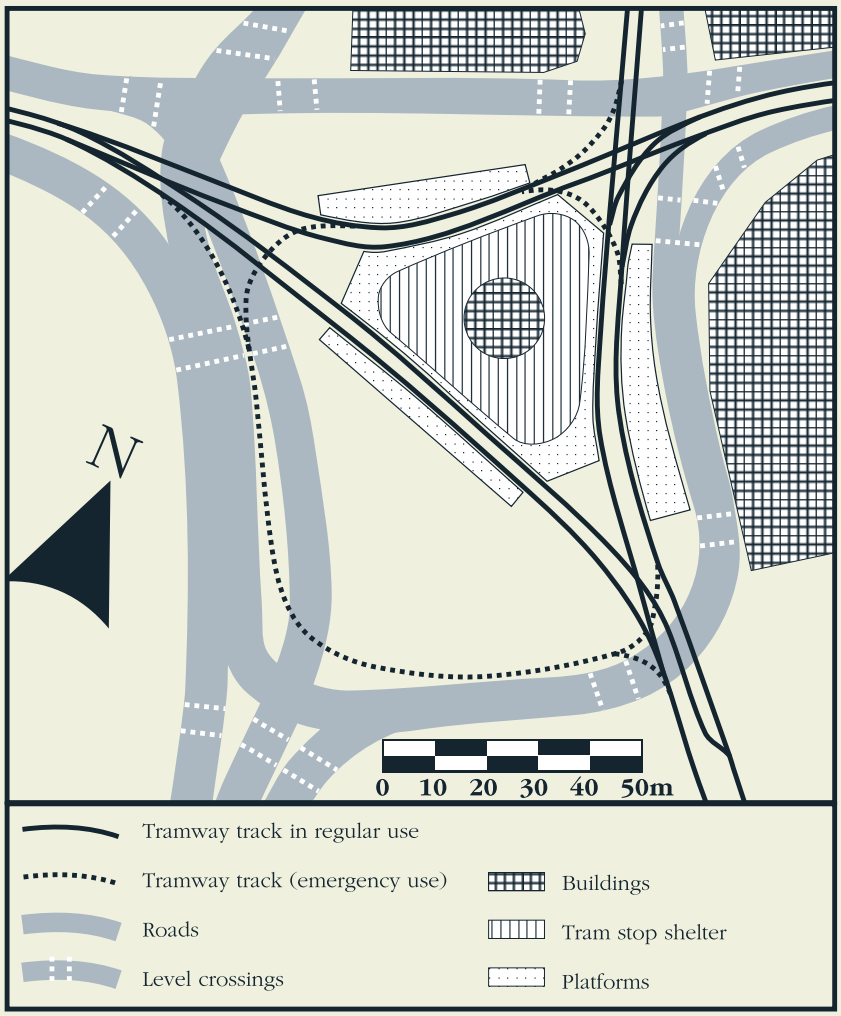


Figure 11.7. Zurich, Bellevue – one of the few integrated transfer junctions in the city centre area. All the transfers are made without crossing roads, and access to the platforms and walks between them is reduced to a minimum. The junction is situated in an attractive space in city boulevard spread along the shore of Lake Zurich

Park & ride and bike & ride parking facilities are also a kind of transfer junction. The main idea in building them is to combine individual transport with a public transport system in all cases where land-use intensity is too small to create an efficient public transport network. From such areas passengers drive to the transfer junctions where they shift onto rail, tram or the underground (although using a bus in park & ride systems is not common, at least in big cities). If the system is to be run effectively it is crucial that infrastructure is provided, such as car parks, and shelters for bicycles. Another key point is the location of the parking places and effective charges for parking as well as for public transport. These should be made in a way that the use of park & ride facilities makes the travel competitive with regards to cost or travel time. This is why the system should be implemented mainly in areas where a public transport is unable to compete normally with the car and beyond the areas of the biggest traffic jams, which will enable travellers to bypass them using public transport. However, particular solutions always have to be tailored to the properties of the area.

11.3.2. Transport as a professional product

Sustainable transport requires a coherent policy in order to make all actions support each other without exclusion. In such a situation a professional product may be created, based on a synergic solution. Managing a transport system should include discouraging the use of transport that increases the external costs of the transport system and encouraging its actors to use desirable means of transport.

Interesting conclusions regarding the benefits of managing the whole transport system coherently resulted from deregulation of public transport taken by Margaret Thatcher's government. With the exception of London, across the whole country the public transport sector began to be entirely privatised, including route planning and organisation. The result was a lowering of the direct costs of running the system (by approximately 40%), but at the same time the number of the passengers fell by 30%, and the access to travel information worsened. Lack of a common policy and a direct competition between carriers led to replacing of transfer bus–train connections by direct bus routes (Wesołowski, 2003, p. 228). All these phenomena increased external costs and thus the total cost of the transport system.

At the opposite extreme are the transport associations best developed in the Germanic countries. These are autonomous municipal companies that prepare a complete public transportation solution in an area. These associations set the routes, schedules and fares, as well as doing the marketing of the product and managing the income generated by the services and subsidies from the municipalities. Passengers are offered an integrated product with all the elements beginning with coherent and complete information on a clear and easily understandable network with the fastest possible connections (usually with regular, repeatable departures and coordinated transfers) and finally one ticket valid on all of the existing forms of transport that serve the area.[12] The carriers also profit from existence of the associations as they are able to compete, but not directly for the passengers but for public tenders for serving particular routes (Wesołowski, 2003). The transport association also works in cooperation with local authorities on the integration of public and private individual transport. One example of such activities are the park & ride and bike & ride systems (see tool 11.T3).

11.3.3. The relation between transport and spatial planning

'What comes next in order to make the green city is not a marvel of technology but the effective management of the existing transport infrastructure' (Low, 2007, p. 153). Several examples supporting this hypothesis have been given in the previous subsection, and we now move to those related to responsible spatial planning.

While describing the conditions needed for development of different means of transport, we have discussed the role of public space as a factor that determines the popularity of walking. The position for each means of transport in the public space is also important. For example, in Detroit demolishing of the historical town hall in order to replace it by car park provided a symbolic act. For many cities a symbol of their urbanity and a costless promotion of public transport is simply the existence of the tramway in the most elegant parts in the city. A similar role is played by the monumental elements of public transport infrastructure, like transfer points or main stations. Many examples for this may be found in France, where new tramway line construction is accompanied by unusual

[12] These can include quite original means of transport, for example a sea ferry in Helsinki or a steam-engine narrow-gauge railway in the Lusatian Mountains (in south-east Germany).

designs of trams, as well as that of the stops, street furniture and the system of the visual identification of the routes (see figure 11.8).

Figure 11.8. A roofed transfer point in an elegant pedestrian precinct in the Strasbourg city centre

A proper shaping of the urban space is not only a matter of prestige and symbolism, but primarily a matter of everyday use. For example, the location of the stops and stations should correspond to the location of the objects that they serve. For individual, intensively used and visited objects (for example huge shopping malls, and main railway stations), this means locating public transport just by the entrance, or even inside the building. While structures generating passengers are more dispersed, this is aimed at conducting public transport routes in such a way that the distance between the stop and the building is reduced to a minimum. In city centres, this often means conducting routes through pedestrian precincts, elegant squares, and streets. What influences the time in which we are able to reach the stop or station is also the accessibility of the platform. This is more efficient if the platform can be accessed from both ends or, at least, in the middle and if there are no stairs on the way to the stop (figure 11.9). In many Polish cities, the issue of proper location and accessibility of stations and stops is still largely ignored and even newly-built lines are marked out far from the structures that provide the passengers, located instead among monumental objects of engineering.[13]

[13] For example the Light Railway in Poznań and Krakow (Kurdwanów District) or the transport solutions provided by the Lodz Kaliska railway station.

Figure 11.9. Helsinki where the platform for the tram stop can be reached easily by flat crossing points leading to both ends of the platform. These exist in spite of the fact that the street is also crossed by a subway passage for an underground station below. Even in such a situation the safety of pedestrians is assured by a speed limit for the cars (set at 30 km/h)

If only possible the urban space should be shaped in a way that is conscious of further transport services at the area. Distribution of different amenities in the area, their segregation and coexistence, as well as their internal structure should determine transport needs, including the distance that has to be walked to access each means of transport (figure 11.10). Finally, this is also a planner's decision on which means of transport will be used in a given area, which we shall discuss in the following section.

Figure 11.10. Transport services in the housing district of Retkinia (Lodz, Poland). Location of the stops is marked as well as zones of possible access in 1.5 min (100 m) and 5 min (400 m). A centrally laid tram line makes it one of the best served districts in the city for public transport. On the other hand, within the access zones for buses we can find huge empty spaces. There is also a very low number of objects in the first zone that shows a high level of segregation typical of spatial planning in the 1970s and 1980s (adapted from Konopska et al., 2007)

11.4. Sustainable mobility as a process

Achieving sustainable mobility is a long-term and complex process that encompasses the infrastructural and organisational activities that we have already discussed alongside educational and marketing activities. We now evaluate what possibilities there are, the choices in this area and what the factors may be that will affect the final decision. At which point we shall examine examples of sustainable mobility-orientated activities and the local reaction by society. Finally, we shall review some of the ways of promoting sustainable transport.

11.4.1. An art of choice

As we have already noted the structure, efficiency and shape of a transport system depends on the decisions of local and national governments. Once again, North American cities provide an interesting example of this. In the post-war reality the government introduced large-scale subsidies and credits for the suburban settlement, which was supported by the building of highways into the suburbs. Through such actions the downfall of city centres with all the consequences that we described earlier were additionally compounded. No more than 30 years were necessary to bring about these irreversible changes (Wesołowski, 2008). The decision to do this was probably taken through an enlightened intention to improve living conditions, but with little knowledge or foresight to predict all the possible outcomes of this. However, even while confronted with a directive from above, local resistance can reverse negative processes. A good example of this was in Portland (Oregon) where the land area available for new housing was intentionally limited for many years. As a result, Portland managed to keep its traditional city structure, albeit with land prices there among the highest in the United States.

The city of Curitiba provides another interesting example. This Brazilian city is now one of the richest and best developed cities in South America. Over the last 60 years it has grown at an impressive pace increasing the number of inhabitants from 150 thousand to 1.8 million. Contrary to the trends popular in the 1960s and 1970s, and in spite of having no spatial barriers, the city decided to develop public transport, cosy public spaces and limited car traffic. High living standards encouraged the inflow of investment in high technologies (Wesołowski, 2003). Curitiba also continues to be a clean and an easy accessible city that is a result of a high proportion of public transport in the modal split, in spite of also having the highest rate of privately owned cars per resident in Brazil (Goodwin, 2005). In this case a decision that was at the time very controversial was taken by the charismatic mayor Jaime Lerner, a town planner elected mayor in 1970. We shall highlight some of his unconventional methods later in the chapter.

11.4.2. Decision making and the basis for it

The intentions of decision makers in transport and in urban planning generally can differ widely (see mental models in section 2.1). Government credit and co-financing extension of suburbs in American cities was a simple example of the high minded intentions that apparently brought unexpected negative effects. Sometimes it is self evident that the reason for the failure of a project is an underestimation of the possible consequences and a lack of sufficient knowledge, as in the case of British deregulation of the public transport. However, it could also be that decisions (both with negative and positive effects) are taken only as an idée fixe (in Frankfurt or Curitiba for example).

What is also a repeatable scheme is the 'sin of neglect'. In most cases, this means that infrastructure is not being maintained properly resulting in its deterioration and finally liquidation when a major overhaul becomes the only way to keep the infrastructure in service. As this situation is highly repeatable in the case of rail infrastructure (for trams and railways do not share infrastructure with other means of transport), it is often presented as an 'economisation' by replacing rail transport with buses. In the place where the tracks used to be, roads are extended or even nothing replaces them. Car traffic rises (the bus that was said to be 'cheaper in maintenance' gets stuck in traffic jams the same as the car does, so passengers prefer to sit in their own car rather than in a public bus), the bus loses paying passengers, and sometimes even stops operating altogether (see figure 11.1). Such small steps even led to a complete liquidation of a tramway network with 1500 km of the tracks in California in the first half of 20th century (Wesołowski, 2003). An almost identical mechanism led to the demolition of tramway lines to the residential area of Ruda Pabianicka or suburban lines to Tuszyn, Rzgów and Aleksandrów Łódzki in the urban area of Lodz. The argument for the so-called savings (that were in fact generating the higher external costs) was repeated in the further demolition of the lines in the Silesia urban area, and when the national railway network in Poland was gradually being shrunk. This phenomenon seems even more surprising when we take into account that the external costs thus generated are often paid by the actor who contributed to changing the system, with the change only delaying the costs involved. Because who else but the local authority pays for the building of new roads to accommodate the new vehicles that appear after the tram lines are demolished? Who but the government will have to pay for maintenance of the road that will serve the people and the goods that no longer go by rail?

11.4.3. Sustainable mobility and the social attitudes

The reason for the existence of local authorities is to serve and organise the local society. Thus, the solutions they develop have to be acceptable for the citizens, as is in the case of transport issues (see also chapter 14). At the same time, this does not mean that the transport system should be fully subordinate to the temporary wishes of citizens, because they may not have the proper knowledge to estimate the implications of a given proposal. The basis here should be on a dialogue and creating a way to allow both the sides understand the implications of the processes evoked. This is because both citizens and local authorities can be right at different times.

What usually evoked major protests in the past was limiting possibilities to enter the city centre by a car. The most active objectors used to be the merchants who had their business in the area affected by restrictions, and afraid of loosing their most wealthy clients. However, in most cases, when local authorities managed to push changes through, the merchants have benefited from them. Such was the situation in Copenhagen (Low, 2007), Krakow (case study 11.C1) and Curitiba. In the latter the conflict went down in history when the mayor of Curitiba facing protests and even a law-suit from the merchants sent the workers to rebuild the road during the weekend, when nobody noticed. When the merchants came back to work on Monday they found their road transformed into a promenade and filled with children playing in a newly attractive space (Wesołowski, 2003).

Similar conflicts have resulted from the removal of the tramway lines with one of the most famous examples being in Frankfurt where through the 1980s, the city

council aimed to remove tramways from the city centre streets. However, in this case finally under pressure from the community the plans were abandoned and by 1999 the city was even able to open a new tram line in the city centre. It is worth remembering that nowadays these particular conflicts have grown between local authorities and the residents in several Polish cities, especially in Gliwice, Będzin and Pabianice. The motives for citizens' resistance are often 'only' habits and tradition, and not a high environmental consciousness or understanding for the virtues of the tram. However, in such a situation, sentiments often become the first bastion in the preservation of infrastructure and keeping the necessary terrain for subsequent and more sensible decisions.

11.4.4. Marketing the sustainable mobility

As we have noted in the previous subsection, social activity may result from different effects and be both an incentive for change and an impediment to sustainable development, and in many cases, achieving set goals requires a suitable marketing policy. Probably the most recognisable campaign, introduced in several countries is the Car Free Day and the European Mobility Week. The range of the activities that take place on those days goes far beyond the concerts, fests, special lessons at schools or other informational actions. The event may be also a pretext for trial implementation of more environmentally friendly solutions. For example, in 2006 in Helsinki, parts of the city centre streets were closed to cars and in the parking spaces instead of cars were placed huge plaster imitations of cars and turtles.

Such actions are not just a jamboree, they also provide an opportunity to collect practical data on traveller behaviour and their changes. This makes it possible to predict and estimate the effects of further and more permanent limitations. Similar studies can also be conducted in the case of renovations. What is interesting is that most experiences indicate that traffic quite easily and automatically reduces to a balanced level, sometimes immediately, and sometimes in the first few days. It has been suggested that in such a situation two typical comments from the local planners are most common (Goodwin et al., 1998, p. 2): 'it will be all right by Friday' and 'the traffic has disappeared and we simply don't know where it has gone'. Regardless of any humorous aspects to the matter, such experiences may be advantageous, as they cannot be rejected as not being in accordance with local specifics, in the way that the theoretical models may be accused of.

A renovation may also serve as good opportunity for promoting a sustainable mobility as a marketing action. If the road is being rebuilt and the traffic is limited, special priority should be given to an efficient public transport system. In such a situation, those drivers who decide to give up driving need to be provided with reliable public transport. If for instance the railway or tramline is being rebuilt, a substitute bus should be given priority so that passengers are not left without efficient transport (case study 11.C2). Similar extraordinary arrangements are made during the mass events or for example during the All Saint's Day in Poland when most people visit cemeteries and the traffic suddenly increases. However, in these circumstances, this is more frequently regarded as a higher necessity rather than a citizen-oriented action.

The key to introducing the principles of sustainable mobility is to develop a habit for easily changing transport behaviour, depending on conditions and needs. As Møller and Thøgersen (2008) wrote, using a car only while moving in the city is in most cases a

habit. If we manage to overcome this, the way to sustainable mobility will be much less bumpy, even when the public debate moves into discussion of values, such as freedom of movement or free market. It has to be remembered that free market competition refers also to the competition between cities, where freedom also means 'the freedom to enjoy the urban environment on foot and in fresh air' (Low, 2007, p. 133).

11.5. Summary and conclusions

Fantasy writers created a vision of a city of the future that became a part of common conventional wisdom. This vision saw the city as a mega-structure filled with ultra-modern and sophisticated transport infrastructure. Meanwhile, the real city of the future seems to be a contradiction of this vision.

A genuine revolution appears not to be the unique technologies of the future, but the ability to apply solutions that are already known. Developing the city is not a result of spontaneous extensions, but rather a matter of rationally managing those resources that the city already has. 'A green city of the future' will with ease utilise all the means of transport giving the victor's wreath to the more traditional approaches, with lower external costs, such as walking, utility cycling and mass public transport. Developing the city harmoniously does not yield to the temptation of reducing public transport in order to make short-term savings, but optimises this through infrastructural, organisational and marketing activities. Spatial structure, transport infrastructure and the people that use it all contribute to a coherent and efficient system. The decisions taken by the city are conscious of their outcomes and have their roots in a coherent strategy for development, and not on short-term, hasty ideas.

The city with sustainable transport becomes an attractive place for living, and wining the competition with other cities. It attracts well-educated people and innovative entrepreneurs, and it inspires creative work. In these ways the city bases its economy not on the exhaustible resources, but on the knowledge that facilitates sustainable development.

Practical resources

<www.caravel-krakow.pl> the website of the Civitas Caravel project in Krakow which contains short descriptions of innovative transport initiatives released by the city and supported by the European Union.

<www.mobilityweek.eu> the website of the European Mobility Week which contains information on the activities of participating cities during this week.

<www.tfl.gov.uk> the website of Transport for London which contains information on the congestion charge applied in the centre of London.

Questions

1. Give examples of the urban structures that are planned to facilitate walking and cycling, public transport, and cars. How have they transformed since they were created? To what extent did the previous transport solutions turn out to be successful? How would you assess their current functionality, vitality and aesthetics?
2. What methods for lowering the external costs caused by different means of transport can you provide? Give examples as well as the theoretical possibilities.
3. What are the gains that can be made by an integrated management of the transport system? Recall some solutions that were implemented in different cities, and their results.

4. List the means of urban transport and describe what the conditions are for which they can function effectively. Illustrate your answer with examples.
5. Suggest the methods for promoting the idea of sustainable mobility to citizens. What conflicts could you expect?
6. What are the relationships between public space and the transport system?
7. What aspects would you consider in implementing a public bicycle system in your city? What would be its advantages and disadvantages?
8. What methods for reducing car traffic do you know of? What may be the consequences of implementing them?

Case study 11.C1.
The transport system of Krakow

The path that Krakow took to sustainable mobility repeats the story of the concept itself. The beginnings for actively managing the transport system in Krakow, the icon of Polish cultural tourism, were linked to concerns for the city's historical urban fabric. In order to protect this, the city introduced already in 1988, the first zones of paid parking, zones of limited access by car, and finally a pedestrian precinct. The changes had been broadly discussed since the beginning in the 1980s (Rudnicki and Kollbek, 2007). Notably, these restrictions were introduced before the change in the political system in Poland, which also initiated the mass motorisation of the country.

Since then further streets and areas have been incorporated into the zones and the final model is intended to remove cars completely from the oldest historical area of the city within the green ring of the Planty Park. The adjacent area is intended to become a calmed traffic zone. Within the Planty Park this process has been mostly completed. Part of the streets are set aside for walking and cycling only (the area known as zone A), other parts of the streets are for access by residents and public transport with speed reduced to 20 km/h (zone B). Entering the area by other vehicles is also possible with parking time limited to 2 hours exclusively in three places (zone C). The planned changes are only minor but aim to ban traffic completely (a change from zone B to zone A) in the adjacent roads.

Much larger changes are also planned to the first bypass (the roads that run alongside the Planty Park) where the traffic is to be gradually removed from the bypass by disabling transit through it. Following to the model of Gothenburg (see tool 11.T2), the ring of the area around the Old Town up to the second bypass is to be divided into sectors that will be free to access, but impossible to cross (figure 11.11). The whole area is also to be included into the zone C with its limited parking time. Dividing the area into separate sectors has already started on short stretches of Karmelicka street, whilst Długa street cannot be driven through on the short stretch of the road adjacent to Planty Park and thus these areas are free of the traffic. Closing a part of Karmelicka street did result in the type of conflict familiar to many other places in the world, namely protest by merchants. They demanded compensation for their lower expected incomes due to limiting car traffic. The city did however manage to introduce the changes and the merchants as usual profited from the change.

Despite the positive experience, the proposed traffic arrangement did not gain enough acceptance. Rudnicki and Kollbek (2007) noted that because of protests on the social side, some of parts of the model were removed from the final version and some of the roads planned for closure to cars finally are still to be free to be driven on. This was the case on some roads that border some of the other sectors (for example Lubicz and Stradomska streets) and longer parts of the roads around the Planty area (St. Gertrude and Westerplatte streets). Moreover, in spite of officially approving the final traffic model, as well as the successes of the changes that have been implemented so far, the issue of reduction of the traffic in the city still is a hot topic for a public debate. To make things worse, the local authorities are not consistent in their activity, for example the extension of the 'zone A' announced for September 2008 is yet to be implemented.

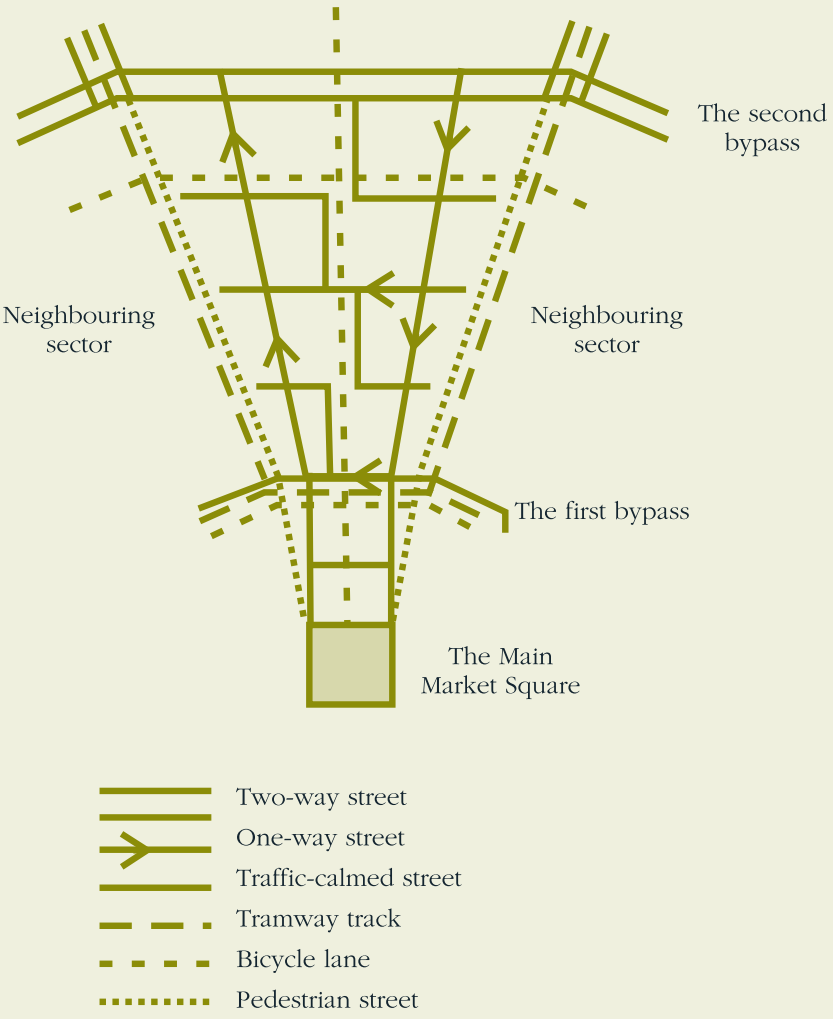


Figure 11.11. Model of traffic organisation in the centre of Krakow – the structure of a sector (Rudnicki and Kollbek, 2007)

Public mass transport provides the highest share of the transport service in the centre of Krakow. The model assumes using mainly the existing infrastructure: the tram lines that are situated in the streets that are borders for the sectors, as well as those on the first bypass and Franciszkańska street that crosses the Old Town. A frequent tram service is now possible thanks to traffic reduction. Even in places where cars are permitted to enter, the trams have priority and their tracks are separated with induced signalisation that enables the tram to pass the crossroads as traffic lights change according to their priority. The direct speed in the centre is reduced which has to be kept for the safety of other road users (mainly pedestrians and cyclists), but the overall speed remains satisfactory due to the avoidance of stopovers other than at passengers transfers.

A light rail[13] is intended to become the basic form of public transport in the city. Rudnicki and Kurowski (2006) indicated that it is the most effective for travelling a distance of up to 15 km, which almost completely covers the city's needs (95% of travels in the city). The dynamic development of tram network was mentioned in a local study

[13] In Polish it is often called 'a fast tramway'. This name refers to a tramway that is characterised by a high priority being a result of infrastructure properties (for example separate track), as well as organisational amenities (for example induced traffic lights).

on the conditions and directions of spatial development,[14] as well in the 2007–2015 transport policy which also mentions developing rail infrastructure with a priority of light railway as one of its basic principles. Maintaining a leading role of the tramway in the transport system is to be guaranteed also by current maintenance, modernisation and upgrading of the existing infrastructure, as well as a consequent replacement of the rolling stock.

Other priorities of the transport policy of Krakow are also worth mentioning because of their professionalism and hierarchy of goals, even if some of them will not be put into practice. The transport policy mentioned a need to counteract urban sprawl, to coordinate spatial planning and transport organisation, and emphasised the need to maintain high quality public space in order to stimulate walking, cycling and the use of public transport. The policy also stated the need for internal spatial integration of different forms of public transport, as well as a uniform system of fares across the whole urban area. This is to be combined with increasing the priority of public transport. Even though the document did mention developing the road network, its main purpose is making public transport more efficient. Finally, the document also paid attention to building the functional, high quality bicycle routes.

Krakow's activities in the area of sustainable mobility have been supported by the city's participation in the Civitas Caravel European project. A large part of the innovations implemented in the city were actually proceeded as Civitas Caravel activities to enable faster and better modernisation, especially via improved the social dialogue. Finally, the project also became an 'incubator' for experimental solutions (at least in Poland).

One of these was a pilot implementation of car pooling (see tool 11.T2). Promoting this form of travelling was put into practice in cooperation with the Technical University of Krakow. A website was created to facilitate contacts between people interested in shared travel, both for drivers and passengers, when the website identified a common route, it exchange contact information for them.

Probably the most interesting was the concept of the 'elastic lines', also called a dial-a-bus service. The idea was created for the sparsely inhabited suburbs and estates, where a regular public transport was difficult to justify economically. In the case of the elastic lines, the buses do not have any permanent routes. The routes are planned according to phone information provided by would be passengers with the bus taking them to a transfer point which is the only constant point on the whole route. The experiment has shown promise and the areas where the service is available have already been extended. Also, the first Polish urban bicycle system was established in Krakow through the Civitas Caravel project.

The question then is how the above activities part of which are still in the planning stage become reality. For example, since the development of the tram infrastructure had been approved in 2003, only the junction near the railway station was built and the contractor for building the new line to the Płaszów district was selected. On the other hand, plans and pledges by the city are also particularly important when considering that in other places in Poland, local authorities are still planning a mass removal of a tram lines and building new roads through historical buildings and urban structures.[15]

[14] 'Studium uwarunkowań i kierunków zagospodarowania przestrzennego miasta Krakowa', 2003.
[15] One example was the project of a local study on the conditions and directions of spatial development in the city of Lodz (Miejska Pracownia Urbanistyczna, 2009).

It is also worth quoting data on the results of traffic calming in the centre of Krakow. Rudnicki and Kollbek (2007) noted that regarding the existing traffic organisation if the number of cars entering the Old Town were reduced even by a small amount there would also be a significant noise reduction. Although the intensity of the traffic has risen on the second bypass, this has not been a significant growth. In preference research, only 19% of the people stated that they used a car to go to the centre, and as many as 70% stated that they used public transport. Even when talking about the journeys outside the centre of Krakow, the declared car preference was at the level of 31%. Thus, the share of mass public transport in Krakow was very high compared to other Polish cities and the Old Town remains a treasured element of the urban space. In effect, one may venture to say that the strategy works and should be recommended for other cities as an example for them to follow.

Questions

1. Compare the activities that Krakow undertook to implement their idea of sustainable mobility with similar activities undertaken in the major cities in your country.
2. What are the most important benefits of Krakow's participation in the Civitas Caravel project? What significance did they have for the whole city?

Case study 11.C2.
The Śląsko-Dąbrowski Bridge in Warsaw

The evolution of the traffic organisation on the Śląsko-Dąbrowski Bridge in the centre of Warsaw is an interesting example of 'elbowing a way through' by the sustainable mobility concept in a city that has been under extremely strong pressure from private cars. The Śląsko-Dąbrowski Bridge is a crossing over the Vistula river that was built just after the World War II, as a part of a transit street (the East–West road). The road opened in 1949 and is also well-known for a tunnel under the rebuilt Old Town. Due to its central location and a relatively low capacity, the bridge has been constantly blocked by traffic jams. In these jams, alongside private cars, public transport also used to get stuck, as the road was used by all vehicles. For a long time the city council was not eager to proceed with any form of priority for trams and buses, regardless of the problem or the protests of citizens.

Initially, it was said that lanes for tramways would be created after building another bridge in the city centre, the Świętokrzyski Bridge. However, the new bridge merely created more traffic instead of taking vehicles from the old one, so the matter of public transport priority was abandoned. It was even said that separating lanes for public transport would have been a 'drastic' action. The social side of the conflict repeated postulates, provided additional calculations,[17] and even hung a banner that demanded to 'free the tram from the traffic jam'.

A breakthrough came in the middle of 2007 when the tramway line on the Jerozolimskie Avenue needed closing. This route was served by the largest number of trams in Warsaw and the one on Śląsko-Dąbrowski Bridge was intended to take over a huge part of the traffic. Facing a situation of complete paralysis, it was decided that temporarily the tramlines would be 'separated' from cars by a plain line drawn on the street. Similarly as in many other cities, a temporary situation was used to check an influence of increases in traffic. The effect was satisfactory enough to keep the lanes in place. Furthermore, in 2009 the bridge was completely closed because due to renovation and only shuttle public buses were able to run on it. A similar public transport priority was promised for introduction in the case of building a new underground line. Since then it has become the rule that a specially organised, efficient public transport is introduced in all situations where road transport has to be reduced because of renovation works. As a result of the renovation works on the Śląsko-Dąbrowski Bridge, the separated lanes for trams were made permanent, and also were made available for public buses.

The history of this particular solution may seem only a conflict between two groups of the citizens, so it is worth mentioning the basic argument that influenced the final decision. It was calculated that 77% of users of the bridge crossed the river using public transport with only 23% by car, despite the fact that every 24 out of 25 vehicles driving the route were private cars. A minority group of the users had generated most of the external costs connected to the existence of the bridge. Dedicating one lane for exclusive use of public transport limited a car capacity by 40%, but at the same time let the speed of the trams rise from about 9 km/h to 30 km/h and kept the speed of the cars at a level of 20–30 km/h which meant that the ride might not have been fast, but was much

[17] An interesting example, even if based on some simplifications, was the estimation of the value of the public transport rolling stock that queued unproductively in the traffic jam instead of carrying passengers through the city (estimated at 33 million zlotys).

smoother. Through these means travel times on the tramway had fallen from 17 to 5 minutes (Szymański and Włodarek, 2006, pp. 6–14).

However, the effects of the conflict around the Śląsko-Dąbrowski Bridge in the scale of the city were only a minor convenience. This one route has not in itself made Warsaw a 'green city' as it continues to have one of the most capacious road networks in Europe (Wesołowski, 2003, p. 207) with traffic jams an inseparable part of the cityscape. On the other hand, as we have highlighted before, sustainable mobility is a process and which has a complex and long-term character. The 'campaign' for the Śląsko-Dąbrowski Bridge is only one step, albeit in the right direction. It also means that the rules for sustainable mobility are gradually becoming understood and the citizens alongside the local authorities are becoming aware of them.

Questions

1. What arguments in the discussion about the traffic organisation of the Śląsko-Dąbrowski Bridge were presented? What arguments influenced the final solution the most?
2. What changes in the structure of traffic in Warsaw might have taken place after its reorganisation on the Śląsko-Dąbrowski Bridge? Consider the modal structure of traffic, its smoothness, and the transport choices of individuals and their motives.

Chapter 12.

Municipal management

12.1. Introduction

Municipal management plays an important role in the pursuit of sustainability and has a large impact on the management of both renewable and non-renewable resources. In Poland it is the local authorities who are responsible for the provision of water and heating alongside the management of sewage and solid waste. Because the majority of local authorities take their responsibilities in this area very seriously, the level of provision of public utilities in Poland has been improving.

To a large extent, it is the local authorities that shape municipal management via direct investment, local legislative action, use of economic tools, and a range of educational, informative and promotional activities. Through inspiring examples and good practice case studies transferable into Polish reality, this chapter can be used as a support tool for local authorities and other leaders for the planning and implementation of their decisions.

This chapter begins with a brief summary of the current state of the municipal management in Poland before outlining the main challenges and problems. We also present technological and systems solutions that can be used as part of solutions to identify problems and on a broader sense feed into sustainable management of public utilities.

Special attention is paid here to the issues of solid waste, water–sewage systems and energy management, as issues identified as those currently having the most room for improvement. That said the examples presented here will primarily be focused on integrated projects which require systems solutions to what are interdisciplinary problems. As such, some of these can provide a source of information to be used as a starting point for inventive and inspirational solutions for those problems that are not directly dealt with in this chapter. Other topics related to municipal management are described elsewhere in this book, such as: transport (chapter 11), space management (chapter 10) and construction (chapter 6).

The considerable value of social participation and activity in municipal management systems is presented in more detail later in this chapter. In summary though those solutions that are developed with the involvement of local communities and other stakeholders are likely to enjoy greater social acceptance and are often easier to put into practice. Stakeholder involvement in the decision making process often strengthens social activity beyond the area of municipal management. As local communities begin to decide for themselves, it can be observed that a civic society is developing. Other than creating strong social capital, these processes also result in the improved quality of municipal services, increased environmental sensitivity and heightened awareness by the users of the public utility infrastructure. Through this process a positive feedback loop emerges (see chapter 2) in which two seemingly unrelated factors (the level of municipal management and of civic engagement) enter into a mutually strengthening, symbiotic relationship, contributing to local level sustainable development.

We use the popular 3R (Reduce, Reuse, and Recycle) rule as means for introducing the topic of municipal management. This rule becomes something of a motto that drives the chapter as a whole. The use of the 3R rule in the planning and implementation stages of the municipal management will likely result in creation of permanent solutions and the avoidance of delayed side effects, thus increasing the chances for sustainable development at the local level.

The 3R rule is one of the most rational models that shows how negative environmental impacts can be reduced and how municipal management can become more sustainable (see the precautionary principle described in section 1.4). Although the rule is most commonly used with regards to solid waste, it can be incorporated into all areas of municipal management and be related to the behaviour of individuals.

1R: Reduce

Activities that aim for the minimisation of unnecessary use of products and services (leading to the reduction of waste in production, consumption of non-renewable natural resources and energy) are often regarded as first and foremost and the most desired activity within the 3R model. Choosing more durable goods creates an opportunity here for beneficial action (other than a reduction in demand and use of goods and services). Due to their longevity, these goods directly contribute to reductions in waste production and the exploitation of natural resources.

In the context of waste management, these actions may be based on implementation of tools and solutions that limit the use of unnecessary packaging made from a range of materials. Disposable bags and materials solely for the purpose of marketing and promotional functions become arduous waste almost instantly. With regards to the management of water resources this first rule may be implemented via the use of water-saving devices, as it will be in the energy sector via the use of energy-saving devices or those powered by local renewable energy. In both cases the first R can also be achieved through schemes limiting waste in both goods' production and transportation.

2R: Reuse

Reuse of products, materials and energy which have already been through one production-use cycle limits the exploitation of natural resources, minimises environmental pollution and other side effects, and also reduces waste. This second rule builds on the possibility of the multiple use of products and materials (often in completely different application). This rule can be exercised via, for example, promoting reusable and fabric packaging schemes (to replace single-use plastic bags); reuse of water (for example the use of grey-water for toilet-flushing) or the use of recuperators which reclaim the heat from the air conditioning systems and return it into indoor space for reuse.

3R: Recycle

The third type of activities should only be introduced if none of the previous rules can be applied (i.e. when the product is a necessity and cannot be reused). Such waste material should be collected selectively and recycled to be used once again in the production process.

The 3R rule portrays a hierarchy of the most rational order of action (see section 14.4) because limiting over-consumption will have the most beneficial effects on the environment, as will product reuse (i.e. prolonging product's life before it becomes waste). Finally, rational recycling helps to limit the negative environmental effects already caused by the processes of resource extraction and waste production. In line with the sustainable way for natural resources management, an object should only be directed to a landfill (or in some other way removed) if none of the three Rs can be applied.

The 3R rule is commonly used in most of the regulations on waste management. The Polish legislature with effect from the 27th April 2001 provides an example of legislation that enacted a rule enforcing the correct sequence of action to be followed in dealing with waste management. By far the most desirable action is counteracting the creation

of waste products, followed by limiting their volume and the harm they may cause, then focusing on recovery (reuse of waste) and appropriate waste disposal. Storage of waste in landfills is the least preferred option. This sequence of action is also recommended by the 2008/98/CE directive but with a fourth element introduced to the 3R model, namely the reuse of energy (which can be considered as another type of recycling).

Undoubtedly some actions are in line with a few of the aspects and conditions set out by the 3R rule, for example the use of separating toilets (tool 12.T1) in which a large reduction in the volume of water used and sewage produced meets all the requirements of the first R, and the recycling of biogenic compounds and water meets the third R.

12.2. Municipal waste management

12.2.1. Challenges

Municipal waste management (MWM) is one of the most neglected areas of municipal management in Poland. On the one hand, the consumption model most often associated with developed countries is accepted and taken on. But unfortunately this model is reflected in the ever growing amount of waste produced: in 2007 Poland produced over 10 million tons of waste, and a staggering 265 kg per capita (GUS, 2008).

On the other hand, the Polish municipal waste management model is far cry from the standards and good practices used in the developed countries. Here, it is still based primarily on the storage of waste material within the environment (95% of total municipal waste) and is characterised by a very low level of recovery of reusable and recyclable materials and the composting of biodegradable waste (2.5% each). In contrast, in Germany only 20% of municipal waste goes to landfill and 60% of waste is recycled or composted.

In its EU accession agreement, Poland made a firm commitment to reduce the stream of waste to landfill to 75% by 2010 (in relation to the total mass of waste produced in 1995), by 2013 to 50% and to 35% by 2020. These figures, however, seem particularly unrealistic but financial penalties are to be imposed if Poland does not meet its commitments.

Incinerators are often regarded as the only possible solution to the waste problem however high financial costs and strong social opposition in Poland mean that these sorts of investments are virtually non-existent. Aside from the discussion about the financial and environmental costs of this approach, it is necessary to highlight that the best of models regarding waste management globally never rely on incinerators as the sole solution to the problem. Rather, incinerators are being brought in to supplement and as an end point for the waste management systems based on the 3R rule.

The most commonly used strategy promotes reuse, reduction and recycling of waste materials and only those materials that cannot be used again end up in incinerators. For example, in 2006 only 45% of the total waste stream reached Spittelau, a model Austrian incinerator (servicing Vienna) where of the remaining waste material, 15% had been composted and 30% recycled (Siebenhandl, 2007). With this in mind, it is essential that the knowledge about this is increased and a variety of solutions promoted because only a combination of these allows for the creation of an efficient and sustainable waste management system at the local level.

12.2.2. Solutions

Municipal waste recycling

In Poland, around 52% of municipal waste produced could potentially be reused in one form or another. Unfortunately, in practice only a fraction of this figure is currently being

recycled. As mentioned above, in 2007 this figure amounted to around 2.5% (GUS, 2008) which in itself is a major increase from the corresponding figure in 2000 of just 0.1%. Consistent and holistic actions are crucial if this situation is ever to improve. Moreover, the analysis of country to country case studies clearly shows that the implementation of a systems approach to the problem of municipal waste may bring great and permanent benefits over a relatively short period.

The United Kingdom may serve as an example here, where the level of municipal waste management was still very low as recently as the 1990s. However, due to consistent technical, educational and legislative efforts and the creation and employment of relevant financial tools (Hogg et al., 2007) the growth in the volume of waste produced has been halted with the proportion of waste that is being recycled increased from 7.5% in 1996/1997 to 34.5% in 2006/2007 (of which 1% and 13% respectively were the percentages of the 'green recycling' (aka composting) (Peattie and Shaw, 2006).

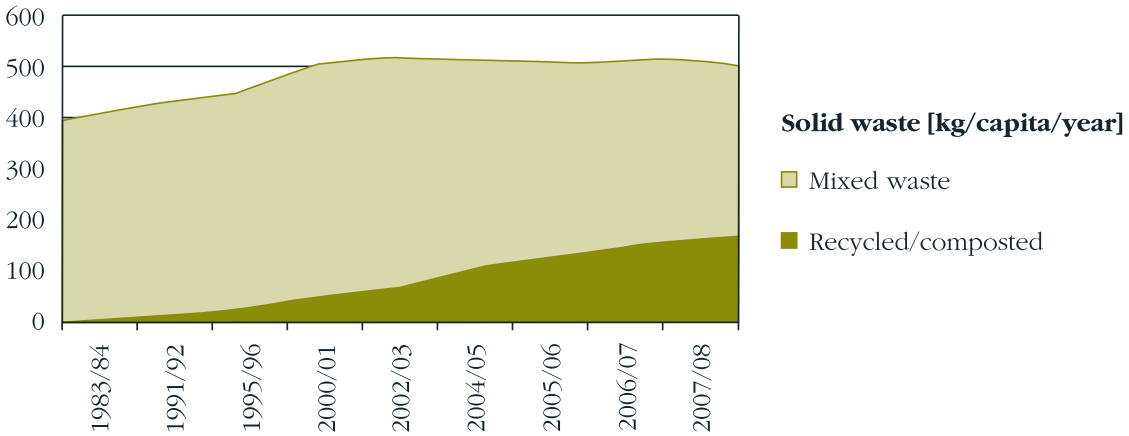


Figure 12.1. Selective collection and composting within the stream of municipal waste in the United Kingdom (Peattie and Shaw, 2006)

These British successes as well as the best of European practices are not only based on the growth and promotion of recycling-related activities because the hierarchy of the 3R is always employed, in which recycling is preceded by waste reduction and reuse efforts.

Recycling is commonly regarded as synonymous with sustainable waste management but wrongly so. Many materials (for example the majority of plastics) can only be processed a limited number of times via processes which are highly energy intensive and often result in the 'downcycling' (where the quality of recycled material deteriorates with every cycle that it goes through). It is for the very same reasons that, in some cases, incineration of waste (also for energy recovery) can be more beneficial than the commonly understood recycling. Also, it is easy to fall into the so called 'recycling trap' where, misled by the benefits of the process, consumers ignore the two preceding Rs. As a result, the overall amount of waste which they produce increases (i.e. as a rebound effect, see section 3.7).

Organic waste composting

Despite the enormous technological advancements in the waste management sector, composting of organic and green waste remains the most rational and the cheapest form of waste utilisation solutions, both when it comes to construction and use of the necessary facilities and installations (Davey et al., 2008). Depending on local characteristics and opportunities, local governments in developed countries can choose a small-scale

model based on individual household composting sites or a large scale form based around large central facilities (Siuta and Wasiak, 2000). Polish waste management policy does not include or plan for the collection of organic waste even though this aspect of waste management is also proscribed by a variety of obligations in line with the EU waste management directive and the terms of Poland's EU accession treaty.

Biogas production

Another interesting form of organic waste utilisation is the production of biogas. In Sweden, local governments choose to finance this approach on an increasing scale; although in 1994 Sweden only had five biogas producing facilities, the number has since grown to over a hundred. Analyses conducted by Swedish scientists (Lantz et al., 2007) confirm that biogas can be produced at the lowest cost using industrial organic waste first, followed by waste from municipal sources. The success of this solution has best been reflected by the fact that it simultaneously solves a range of municipal waste management problems. Through an integrated, holistic approach, it combines waste management with energy recovery and recycling of biogenetic compounds. To illustrate this solution, we can use as an example of one of the oldest biogas producing facilities in Sweden, in Uppsala, where the processing site takes in the following waste products:

- slaughterhouses waste (9500 tons of solid waste and 1000 tons of blood);
- restaurant, diner and supermarket waste (1000 tons);
- pharmacological waste (6000 tons of glucose);
- slurry (12,800 tons); and
- limited amounts of organic fractions separated from municipal waste.

In this process solid waste is ground and pasteurised at 70°C for one hour, after which it is left to ferment at the temperature of 55°C for approximately 20 days. The site produces daily around 2000–3000 m^3 of biogas with a 65% methane component. 50% of the biogas produced is used in municipal heat generation. The remaining 50% becomes fuel for public transport vehicles, as well as for school buses and taxis. What material remains from the process is given over at no fee to farmers to be used as a fertiliser.

A biogas-powered ambulance was purchased in Stockholm earlier this year in an effort to promote biogas as a reliable fuel it is and encourage public trust in this alternative fuel. This purchase is part of and promotes city's strategy which will see all of Stockholm's buses fuelled by biogas by 2025.

Energy production

Another interesting concept that is implementing a holistic approach and acting simultaneously in multiple areas of municipal management is the production of energy from local sources (including waste materials). We shall describe this aspect of municipal management in more detail in section 12.4, with the interesting example of Enköping to illustrate the potential for local efforts and activities in finding complex solutions in accordance with the principles of sustainable development.

12.3. Water and wastewater management

Recently a significant development has been made in water management in Poland: increasing amounts of wastewater from the urban agglomerations is collected by centralised systems and treated with highly efficient biological processes; industrial wastewater is now better controlled; the big industrial entities have introduced closed water loops; the level of water losses from the network has been minimised; and the quality of Polish rivers and lakes has been successfully improved. However, there are still several areas

where the proper solutions have not been developed or the methods in use are outdated, expensive or even generate additional problems. These aspects of Polish water management, which are currently unsustainable, are the topic of discussion in this section. We also present possible solutions that have been proven to be the most promising and useful in other countries.

12.3.1. Challenges

Poland has one of the lowest levels of water resources available per capita in Europe (Bodik and Ridderstolpe, 2008), and the quality of Polish rivers is not good due to bacteriological pollution and high concentrations of nutrients (Obarska-Pempkowiak et al., 2009). Both of these factors of deterioration are emblematic of insufficient development in municipal wastewater management.

In 2007, the inhabitants of urban areas (GUS, 2008) had the following water services:

- 95% were connected to a centralised water supply system;
- 85% were connected to a centralised wastewater transport system; and
- 87% were using a wastewater treatment plant.

And for inhabitants of rural areas:

- 95% were connected to a centralised water supply system;
- 21% were connected to a centralised wastewater transport system; and
- 24% were using a wastewater treatment plant.

These figures show that most of the challenges for water management occur in rural areas. The difficulty for these areas is highlighted by a hugely disproportionate distribution of facilities, for example a water supply network of 208,696 km connects 2,944,992 people whilst the wastewater transport network is only 46,982 km connecting just 787,265 people (GUS, 2008). The number of single-house wastewater treatment plants is estimated to be nationally as low as 31,000 (Kaca, 2007). A simple calculation shows that more than 70% of Poland's rural population of about 11 million people are not connected to the wastewater transport network, although most are equipped with a septic tank. However, these tanks, even if well-constructed and used, are an out-date solution, expensive and generate a lot of problems and inconveniences during their usage. Besides, in the Polish scenario their contents are often discharged to a local ditch, arable field or even to a stream, instead of going to a wastewater treatment plant. Moreover, these tanks in many cases are septic and sealed only in theory, but in practice sewage leaks into the environment polluting soil, and both ground and surface water. Credible statistics do not exist regarding this situation, but the low water quality and high level of bacteriological pollution prove that the problem is significant.

There is however a risk in applying to the countryside those solutions that have been used in cities and other densely populated areas. The centralised system that has been tried and tested in urban areas, which uses water to transport pollutants to a final wastewater treatment plant would be very difficult to build and to maintain in areas of low-density housing. Such a system would also be irrational from environmental, hydrological and economic points of view. This has been confirmed by the very high costs of wastewater management in some rural communities that have built a centralised system. Despite subsidies from local budgets, the fee to deposit and treat 1m^3 of sewage is still 20 zlotys in these subsidised areas. In comparison, the average treatment fee in large Polish cities is only a few zlotys (GUS, 2008).

The long networks of pipelines that are used in a centralised system also decrease groundwater levels, generate problems with the water supply, cause unfavourable

changes in water regimes and place a higher pressure on river ecosystems, caused by the inflow of high amounts of treated wastewater.

On the other hand, the average water consumption in Poland is low compared to other European countries (figure 12.2), and it is difficult to foresee changes to this situation in future. However, when we analyse the structure of water usage, it is revealed that the largest amount of potable water used is for flushing toilets (at 33%), more than for washing and bathing (20–32%), clothes and dish washing (15%), and only 3% for the food purposes. Thus, even though there is a relatively low consumption of water, there is considerable room for improvement and for making Polish water management more sustainable.

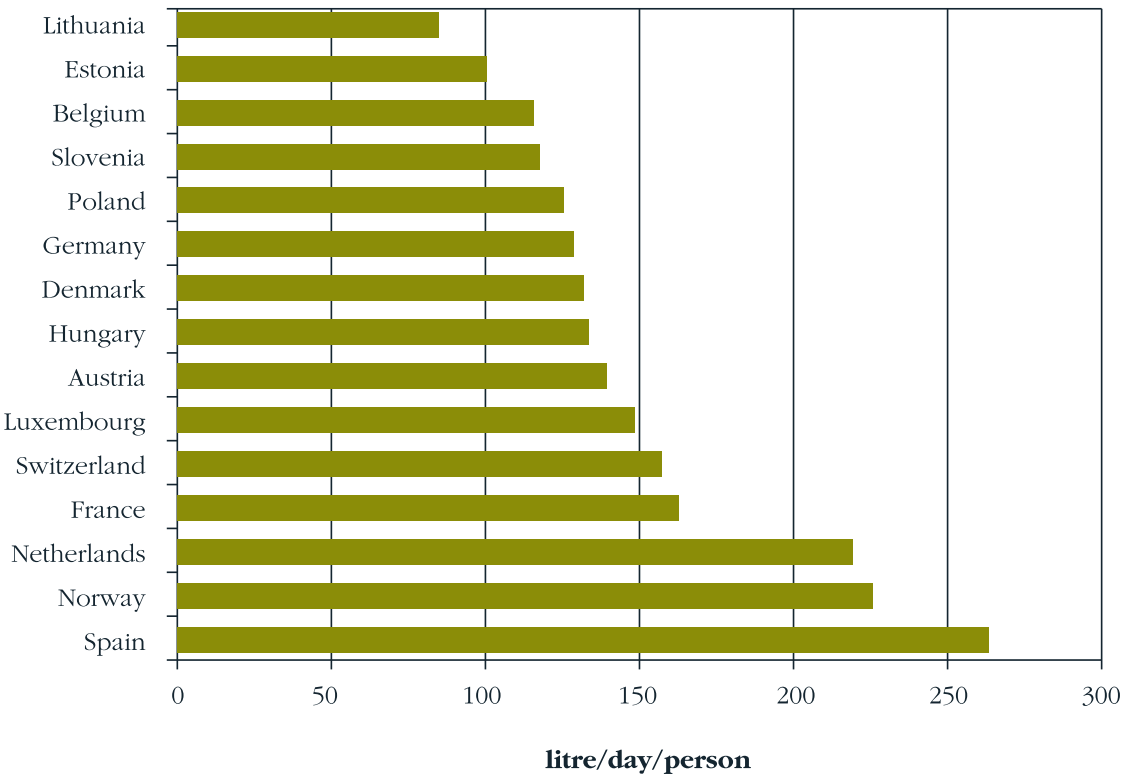


Figure 12.2. Municipal water consumption per capita in selected European countries (UNEP, 2004)

The next negative phenomenon and not limited to Poland, is the disruption of the natural water cycle, which includes changes in the runoff, infiltration and transpiration regimes. These are the side effects of urban development, such as: covering larger surface areas with impermeable materials (roads, parking lots, and pavements, etc.), the rapid removal of stormwater from urban catchments, an increasing number of housing and commercial buildings, and the draining of wetlands (see chapter 10). This increases fluctuations in river flows, and increases the danger of extreme events (such as droughts, water shortages, and floods), as well as negative changes to the micro water cycle, and the subsequent flood damages and losses caused by the heavy rain.

12.3.2. Solutions

To implement sustainable water and wastewater management, it is necessary to apply the 3R principle, described in detail in the introduction to this chapter. Currently, local authorities undertake many educational, economic and technical activities in accordance

with the first R that is to save water. The most important is the use of water-saving devices that minimise losses in the network and by the end-user, and make water prices reflect the real cost of water management. All of them are valuable and lead to water savings and to rationalising its consumption by users. However, as the other solutions that are presented below demonstrate, it is also possible to make reference to more than one level of the 3R principle at a time, and solve problems holistically and sustainably. To introduce them into the priorities of municipal strategies and local policies, to finance and support them, as well as construct the display installations, can solve wastewater problems and in some cases improve the water supply (see the solutions described below).

Water-saving toilets

As the structure of water consumption described in subsection 12.3.1 highlights, the most significant irrationality of current water management is to use the huge amounts of water used to flush toilets (in Poland about 50 litres per capita are used daily for this purpose). This is also an area in which a major improvement is easy and inexpensive to achieve. This is why new and better models of toilets have entered the market. There are both water-saving and even waterless models, which save part of the 6–9 litres flushed in the conventional toilets each time they are used. The most important among available solutions include the following (Petersens, 2001).

1. Two-button toilets, which differ in the amount of flushed water; for liquids they use about 3 litres, and for solids they use 6 litres, which allows for around 50% savings of water use in toilets (which is about 15–25 litres per person per day in Poland).
2. High-pressure toilets, which thanks to the use of a vacuum can be efficiently flushed with the minimal amount of water (about 0.1–0.2 litres per flush).
3. Separating toilets, which use a revolutionary approach to sewage management, which we describe in more detail as tool 12.T1.
4. Composting toilets (waterless), in which sewage is composted in situ (electrically heated) which can then can be used as a fertiliser.
5. Toilets with a ball valve, which thanks to the lack of a siphon and by using special ceramic materials limit water consumption to 0.2 litres for a liquids, and 2 litres for solids.

Stormwater

Another interesting approach that has been used for a long time in Poland, is the gathering of stormwater that can successfully replace municipal water in many of its applications. Stormwater can be used to water lawns, grasslands and other fields; and thanks to its low hardness is suitable for washing a car or even the laundry (Gudelis-Taraszkiewicz and Suligowski, 2008). There are several simple devices on the market, that allow for the collection and use of stormwater. The more sophisticated installations allow for the use of stormwater to flush toilets or even to produce potable water. Reusing stormwater is generally in accordance with the second principle of the 3R approach. However, thanks to savings in municipal water and a reduction of sewage inputs, it also realises also the first principle of the 3R approach.

Authorities in several countries subsidise systems used to gather and use stormwater. This is a result of the fact that these systems provide significant savings in wastewater transport and treatment systems; benefit the hydrological cycle, and contribute to environmental protection and flood prevention. More often fees for stormwater inflows into

a wastewater system are introduced. Such financial tools would also be of use in Poland, where the stormwater systems remain unprofitable, even though they are simple to build, inexpensive and easy to use. According to Słyś (2006), the time for repayment of such investments is several decades for single-family households. Although for the buildings with a larger surface area and better possibilities for stormwater usage this time may be reduced, it is still a relatively long return on investment.

These solutions presented above, based on the reuse of stormwater are the most rational. However, taking into account the negative changes in the water cycle described in the beginning of this section, even the simplest solutions are worth appreciation and popularisation, including allowing stormwater infiltration into the soil or keeping it in a landscape as wetlands, etc. This improves local retention, positively influences the local climate and water cycle through transpiration. This would prevent the depletion of groundwater resources, decrease the risk of the extreme hydrological events, and in the case of a sewage collection system, this significantly stabilises and relieves the pressure on wastewater treatment plants and networks. In this area, considerable technical development has made solutions such as green roofs, green belts, rain gardens, constructed wetlands, and infiltration boxes and chambers popular among investors and decision makers.

An inspiring example in this area is Enköping in Sweden, where an interesting solution to stormwater management is used. The Enköping system uses channels to feed stormwater flow through cascades and small tanks to the Vattenpark a constructed wetland with a free water surface (figure 12.3). The park is also a local attraction that adorns the town, and besides stormwater retention plays an important role in removing nutrients from stormwater. It has had a significant importance in preventing eutrophication of the Mälaren lake and as a recreational area for the inhabitants of Enköping and Stockholm.

Figure 12.3. Water Park in Enköping (Sweden) fed with stormwater from the housing area

Single-house sewage treatment

As we noted in subsection 12.3.1, the number of single-household wastewater treatment plants is very low in Poland. Improvements in wastewater management are very often understood as a transition from septic tanks to centralised systems for sewage transport and treatment. However, if we used the standards used in the developed countries (Suligowski and Tuszyńska, 2008) we would realise that several centralised systems that are currently planned or being constructed in Poland, have no economic or environmental justifications.

In Poland for a large number of users the single-household treatment is the only single rational and financially efficient solution, especially when significant developments have recently been made in this area. Thanks to the achievements of ecological engineering, these devices have a similar efficiency and functionality as big installations, and they do not have the several disadvantages of conventional solutions. They use highly efficient biological processes to treat sewage, and thus differ from the simple single-household solutions, which infiltrate almost untreated sewage to soil, and yet are often considered as the wastewater treatment plants in Poland. Similar technologies used for a long time in several counties have been the cause of soil and groundwater pollution (Bodik and Ridderstolpe, 2008). Legal regulations introduced recently in Norway and Sweden now completely prohibit the use of such systems (Santala and Kaloinen, 2004; SEPA, 2009). This shows that systems based on an infiltration of biologically untreated sewage should not be encouraged in Poland, because they are an out-dated solution that is no longer used anywhere in developed countries. In its place there are now several highly efficient and functional technologies for the single-household sewage treatment (see tool 12.T2).

Tool 12.T1.
Separating toilets

The idea of separating toilets, as their name implies, is based on the separation of the sewage fractions from the point of generation followed by separate utilisation. These systems use a special two-cell toilet (figure 12.4), with separate tanks to gather yellow sewage (liquids) and brown sewage (solids). The scheme for this system is presented in figure 12.5. There are several kinds and solutions for separating toilets on the market, but all of them are characterised by the very low water consumption (table 12.1), with the double advantage that they use less of potable water, which is a valuable resource, and additionally they decrease the amount of wastewater generated (saving up to 25–30% of the total daily water consumption, and about 50 litres per capita).

Figure 12.4. The example of a separating toilet

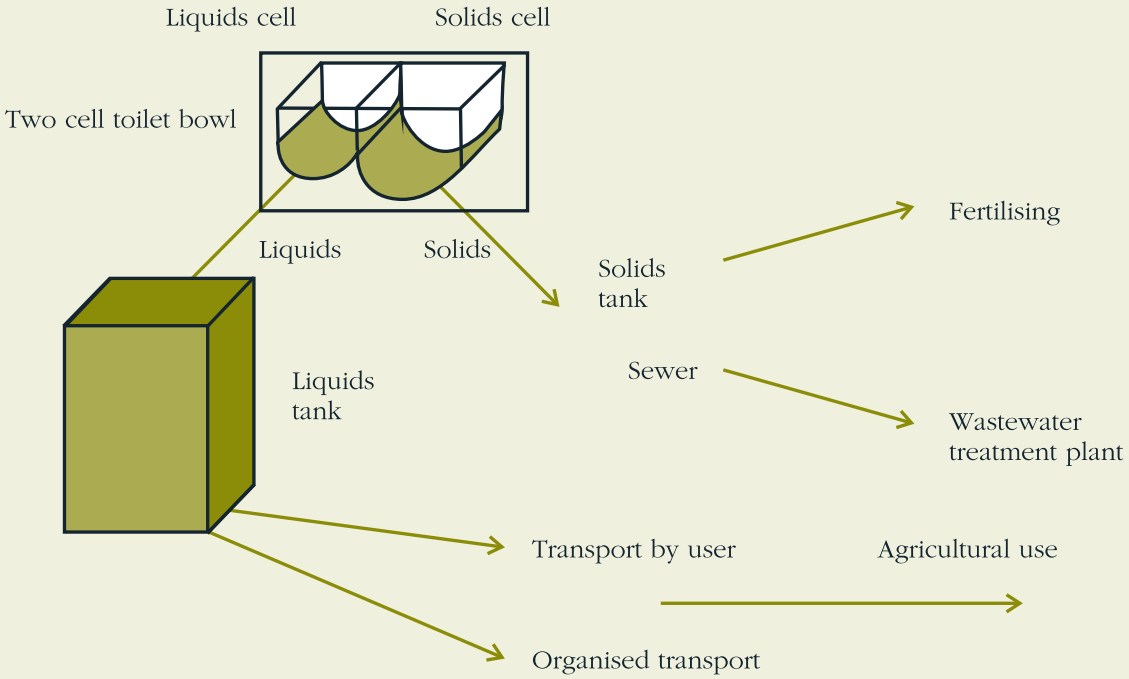


Figure 12.5. The scheme of the separating system (Suligowski and Tuszyńska, 2008)

Table 12.1. Comparison of water consumption by the different types of toilets (Petersens, 2001)

	Small visit	Large visit
Conventional toilet	9.0 l	9.0 l
Two-button toilet	3.0 l	6.0 l
Separating toilet (dry)	0.1 l	0.0 l
Separating toilet (wet)	0.2 l	2.0 l

However, saving water is not their most important advantage. When the composition of the fractions of domestic wastewater is analysed (figure 12.6), we find out that the yellow sewage, which is a small percentage of a total amount of wastewater, contains the high amount of nutrients. Alongside nitrogen, phosphorus and potassium are also present which makes this an ideal fertiliser (Kvarnström et al., 2006). The low amount of yellow sewage allows us to store it in a tank, which only needs to be emptied once or twice a year and used as a fertiliser. Thanks to the low amount of pathogenic microorganisms, long storage and low pH, a bacteriological problem does not exist (Hoeglund et al., 1998). Apart from using yellow sewage as a fertiliser, an additional benefit is the lower production of mineral fertilisers, which are costly and harmful to environment.

Brown sewage, due to its higher level of microorganisms, requires more careful handling (Hoeglund et al., 1998), needing to be composted for one year and in the big systems for two years. After this period it can then also be used as a fertiliser. In simple systems, it can be utilised differently or disposed conventionally. Because of the low concentration of nutrients it can also be treated more effectively than mixed wastewater in single-household utilities (see for example constructed wetlands, tool 12.T2).

When the wastewater separation is applied, the only fraction that needs to be processed is grey sewage. Because this does not contain nutrients or bacteriological pollutants, it is relatively easy to treat and to reuse. As it has been shown, the

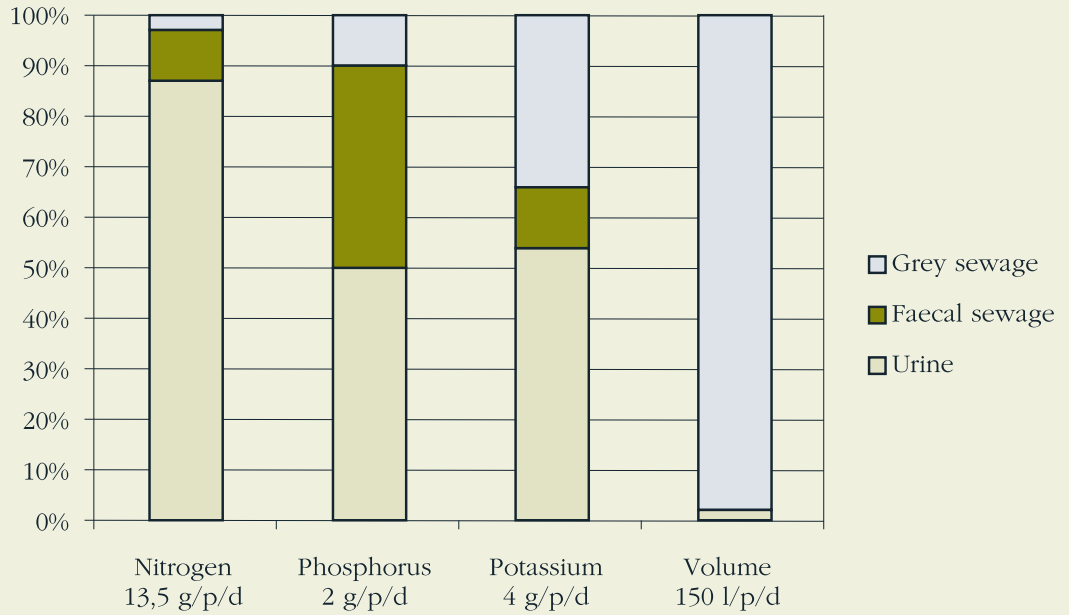


Figure 12.6. Percentage of nutrients in different fractions of domestic sewage and their volume (adapted from Kvarnström, 2006)

separating toilets need substantial interventions in existing infrastructure, and the changing of our attitudes and philosophy to wastewater problems. However, thanks to these technologies significant water savings can be achieved, and the complicated, difficult and expensive to build and maintain centralised wastewater systems will no longer be necessary. Besides this, such decentralised systems are also very flexible and easy to extend. This is also in accordance with the principles of sustainable water management with water and nutrients recycled to the environment locally to become useful resources.

These separating systems have achieved popularity and acceptance in both developing and developed countries. For instance, the number of such systems in Sweden is estimated to be about 135,000 (Bodik and Ridderstolpe, 2008). They are used not only in single households but in also in housing estates, and there are several examples of towns or densely populated areas, in which such systems are used successfully. For example, the town of Gebers in the southern suburbs of Stockholm uses a system for the complete recycling of nutrients and it utilises wastewater generated in 32 apartments, located in a two-floor building. The separating toilets used there required only 0.1 litres to flush a cell of yellow sewage which flows by gravity to two large tanks located underneath the building. It is emptied 3–4 times a year and transported to a farm, where it is stored for minimum 6 months before being used as a fertiliser. Brown sewage is removed via a dry method and moves by gravity to an individual tank again underneath the building, and then is taken away by a farmer (approximately once a year) and also used as a fertiliser. The brown sewage is stored in a tank with a vacuum to eliminate any odours.

Besides this, a ventilation system is installed in the building, which also helps to dry the brown fraction. Practical experience has been satisfactory in spite of a few exploitation and technical problems which were successfully solved (such as badly adjusted slopes and diameters of pipes). These problems were caused by the approach to maximise water savings and the application of the dry toilets. An installation and exploitation of wet toilets would

not have differed from the conventional solutions.

In Poland, the first systems using the separation of wastewater have also been installed. In Stryszów in Małopolska Province, they have been installed at the ecological agricultural Sunflower Farm, where this type of toilet has been placed in one of the clay houses. In Marwałd in the Warmia and Mazury Province, these installations also function in a four-floor building (Suligowski and Tuszyńska, 2008). This consists of separating toilets of the Dubbletten system, with separate systems to deposit yellow and brown sewage, a tank for liquid (using concrete tanks of 1 m diameter), and a tank for solids (also 1 m in diameter). In the last, there is also an additional tank for grey sewage and leachate from brown sewage, deposited to a centralised sewage pipe system. There are two cells in a solids tank (with one being filled within half a year), in which composting takes place. Yellow and composted brown sewage is then used as a fertiliser.

To summarise our description of the separating toilets, despite the fact that they need some extra investment and changes in the habits of users, they have several advantages which make them one of the most rational solutions to the domestic wastewater problem. Besides much lower water consumption, they solve locally two of the most important problems for wastewater management which are nutrient and biological pollution. They are an elegant solution based on the idea of a closed loop. They do not have the bigger problems of conventional solutions including: high water consumption; expensive and difficult to maintain wastewater transport networks; complicated and energy-consuming removal of pollutants from a highly diluted medium; and difficult to manage wastewater sludge due to the fact that nutrients are mixed with other pollutants. These separating toilets have a high potential in Poland and should be considered as a useful option for planning wastewater management and not only in the countryside.

Tool 12.T2.
Constructed wetlands

Constructed wetlands are one of the most interesting solutions to water management, used in both developed and developing countries (Obarska-Pempkowiak, 2002). They are one of the most important applications of ecological engineering (Odum and Odum, 2003; Mitsch, 2003; Mitsch and Jørgensen, 2003), in linking the knowledge of biology and ecology with that of engineering, especially through our knowledge on ecosystem functioning to construct complex technical utilities that are both beneficial to the human economy and environmentally friendly (Kangas, 2004).

The role of constructed wetlands is based on the ability of natural wetland ecosystems to treat and clean water. Thus, their energy consumption is very low and they are very flexible and resilient to wastewater quality and quantity fluctuations, and their treatment process by-product, biomass is easy to handle and to use. In the basic single-household configuration, a sedimentation tank is installed, in which mechanical wastewater treatment processes can occur (figure 12.7). Pretreated wastewater flows through a bed, which is well-isolated, filled with gravel or other neutral filling, and planted with macrophytes.

Even though construction of such a utility is relatively simple, wastewater treatment is driven by a complex combination of mechanical, biological and chemical processes (Bergier, 2003). A mineral bed with plants and a microbiological bio-film creates a filter, which has an ability to remove various pollutants from the wastewater, through sedimentation and filtration of solids, and adsorption of dissolved substances. The removed pollutants are than decomposed by the microorganisms living in the bed. Whilst wetland plants have the ability to transport oxygen to their root parts and, thanks to this, process a mosaic of areas with different levels of oxygenation are created, and a complex but highly efficient treatment processes can occur.

Most of the pollutants are transformed into neutral, common gases and released from the bed in this form. Thanks to this, bacteria-rich sludge is not generated in the bed, and there is no need to remove, transport, or handle it. Only the preliminary sedimentation tank needs to be emptied and its content removed approximately once a year.

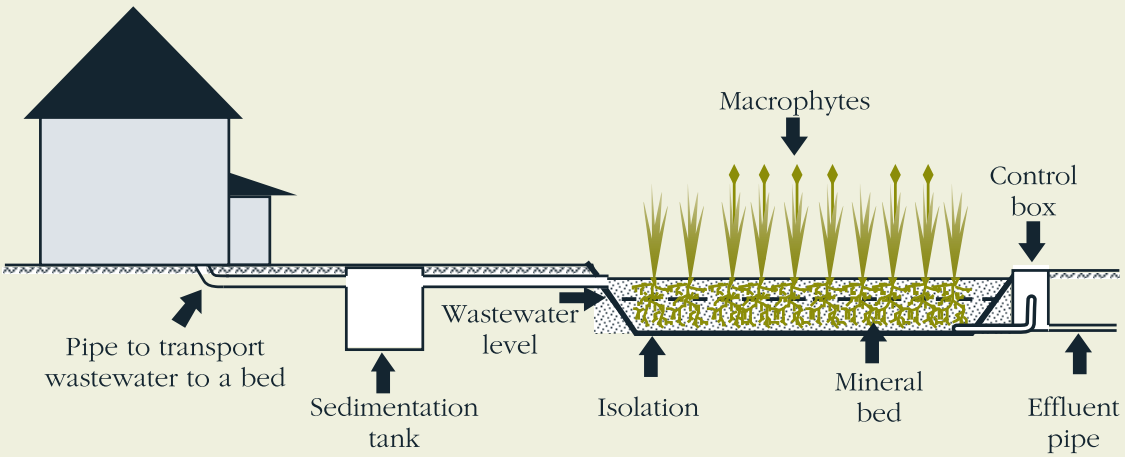


Figure 12.7. Constructed wetland bed with subsurface, horizontal flow (Damurski et al., 2007)

Constructed wetlands also treat wastewater in the winter season, however their efficiency decreases about 20% in cold periods.

The most important advantages of constructed wetlands include:

- low running costs due to no consumption of electric energy and chemical agents;
- little need for maintenance and operation;
- stable and efficient wastewater treatment;
- aesthetics and biodiversity; and
- a low sensitivity to changing conditions and fluctuations in wastewater quality and quantity.

Obviously, as with any solution, the constructed wetland technology also has some disadvantages:

- a high use of space (about 8–10 m^2 per person in a classical solution using subsurface horizontal flow);
- relatively higher costs of investment, driven by a necessity to design for individual conditions; and
- a period of several months before full treatment efficiency is reached.

Another valuable development from constructed wetlands technology are hybrid plants that combine the advantages of the conventional wastewater treatment plants with the constructed wetland beds. The best achievements in this area have been achieved by a Polish designer Włodzimierz Ławacz, the inventor of the EkoPAN technology, which has now been further deve-

loped by a joint venture between the Swedish company PhytoSystem and the Polish EnkoSystem under the supervision of Włodzimierz Ławacz. These wastewater treatment plants take the form of an underground cylinder, the top cover of which is built as a hydroponic bed with a multicultural plant population (figure 12.8). The most important advantages in comparison to classical constructed wetlands, is the much lower area needed for construction (the diameter of an average single-house unit at 1.8 m) and their capability for highly efficient wastewater treatment (with effluent that can even meet standards for drinking water).

Figure 12.8. The hybrid wastewater treatment plant EkoPAN in Łąka near Pszczyna

Figure 12.9. Constructed wetlands designed by the author for the Research Station of Wrocław University in Karpacz just after completion

Constructed wetlands play different roles in single-household wastewater treatment systems. In their most conventional arrangement, they treat all kinds of mixed wastewater. However, when the separation is used (see tool 12.T1), and the yellow and brown fraction is removed, constructed wetlands are a perfect solution to treat the rest of the wastewater, such as grey wastewater and/or stormwater. For the latter constructed wetlands with a free water level can be also used. Constructed wetlands can be also successfully used to treat wastewater from the small populations, as in many cases in Poland. Examples include the reed bed in Nowa Słupia (where many plants were constructed in the 1990s), the Pomorze Province (Obarska-Pempkowiak et al., 2009), and Dziewin (see case study 12.C1).

Due to constant developments in the technology and ecological engineering in general, the scope for the application of constructed wetlands has continuously been extended. They are currently used for the following purposes:

- to treat domestic (figure 12.9), agricultural and industrial wastewater (EPA, 2002);
- to treat stormwater and to keep it in the landscape (Gajewska and Obarska-Pempkowiak, 2008);
- to treat water in swimming pools;
- to protect water intakes (Etnier and Guterstam, 1991);

Figure 12.10. Constructed wetlands in Oxelösund

– to dewater and treat sludge from wastewater treatment (Obarska-Pemkowiak and Kołecka, 2006; Kalisz and Sałbut, 2007);
– to minimise erosion and runoff of pollutants in arable areas (Bergier et al., 2004);
– to treat and recycle stormwater runoff from highways and parking lots (Bergier and Włodyka-Bergier, 2009);
– to form overflow channels for rivers as an approach to sustainable flood protection (Begemann, 1999); and
– as an additional treatment and retention of the effluent from conventional wastewater treatment plants (figure 12.10).

12.4. Energy management

12.4.1. Challenges

According to statistics (GUS, 2009c), and a range of strategic documents (for example Ministry of Economy, 2009), Poland is far behind many developed countries in sustainable energy provision. As shown in table 12.2, the role of renewable energy resources in Poland is far lower than the European average. When compared to EU production of renewable energy, Poland's position was even worse: in 2007 when only 3.5% of Poland's energy was produced from renewable sources, in contrast to the European leaders, such as Austria or Sweden that have levels of 60% and 52% respectively (GUS, 2009a).

Next to limited utilisation of renewable energy, the challenge facing the Polish 'energy economy' is the country's significant dependence on coal (in 2008, 59% of primary energy was produced from the burning of coal and lignite; GUS, 2009c) with low energy efficiency resulting in large losses in energy production and transport, alongside irresponsible industrial use of energy (chapter 5).

With regards to the seeking of solutions and sustainable scenarios for renewable energy in Poland, the most notable resources currently being utilised include biomass (>92%, GUS, 2009a), hydro-electricity (3.9%), biofuels (2.1%), and biogas (1.3%). Other renewable energy sources are only utilised to a very small degree. These statistics demonstrate the enormous potential that there is for improvement and development. Together with limiting energy loss and ineffective energy management, increased utilisation of renewable energy may push the Polish energy sector towards a paradigm of sustainable development.

Table 12.2. The share of renewable and primary energy sources' utilisation (GUS, 2009a)

	2001	2002	2003	2004	2005	2006	2007
Overall share of renewable and primary energy sources' utilisation in the EU [%]	10.9	10.7	11.7	12.6	13.4	14.7	16.4
Overall share of renewable and primary energy sources' utilisation in Poland [%]	5.1	5.2	5.2	5.5	5.8	6.5	7.1

Examples drawn from developed countries show that the implementation of the principles of sustainable development into energy management structures and processes requires centralised action, including the development and implementation of related legal and fiscal tools. However, once again local initiatives, especially those developed by local governing structures and local leaders may help to promote sustainability. This will also improve the quality of life for local communities, increase their independence and solve problems emerging in various areas of municipal and public service provision

12.4.2. Solutions

A range of tools and devices are currently available on the market that may contribute to a sustainable energy economy that are based on both: energy saving (passive houses, prevention of losses in the transmission network) and energy reuse and recycling (recuperators, heat recovery); as well as local production of renewable energy (heat pumps, solar panels, solar batteries and other forms utilising solar energy, wind turbines, hydroelectricity and biomass), whereby all of these are consistent with the 3R rule described in the introduction to this chapter. Examples of these have been described in more detail in chapter 6 (and especially section 6.2 and tool 6.T1) with reference to sustainable buildings and architecture. Local authorities can contribute to the encouragement and implementation of these solutions in their own local areas via educational, promotional tools and financial incentives (such as subsidies) which allow people to engage with and develop this kind of investment as well as enabling a range of other activities (Drzazga, 2008).

However, the most innovative municipalities do not limit themselves to such activities. They apply an interdisciplinary and systems approach to developing holistic solutions to problems and creating innovative ideas for sustainable development, especially in industrial ecology (section 5.3) and ecological engineering (see tool 12.T2). Enköping provided an inspiring example of how an energy economy can be integrated into other domains of public utilities. This Swedish municipality, home to almost 40,000 people, created an integrated system of energy production that was linked to waste management, and to the sustainable management of biogenetic compounds of sediments within wastewater treatment plants (Ryden, 2003).

A 75-hectare willow plantation developed for energy purposes, watered and fertilised with a liquid form of waste sludge, is an important component of this system (figure 12.11). The fertilisation process allows plants to reach a height of 5 meters within three years, and the annual biomass production amounting to 10 t/ha (Hillring, 2000). Biomass produced in this process is then used in the local power plant. Other raw materials used in Enköping for energy production include waste materials from the timber industry (bark, sawdust, waste timber) and biogas derived from the processing of municipal waste (McCormick and Kåberger, 2005). The power plant supplies heat and electricity to the majority of Enköping's inhabitants (serving approximately 12,000 households), it does not use any fossil fuels.

At the same time the plant solves a number of local problems related to waste management. Thanks to a systems approach that went beyond single-sector actions and projects, a role model for an energy economy was created, based entirely on the utilisation of local resources. It does not deplete the non-renewable resources of our planet, and serves and benefits the local community. The most crucial of these benefits are independence and energy security and the development of solutions for the difficult problem of sewage sludge (see section 12.3) and solid waste.

Figure 12.11. Enköping, willow plantation for energy production

12.5. Social participation

As already described in the introduction to this chapter, social factors are key when it comes to all the activities and decisions regarding municipal management. Drawing exclusively from a pool of expert knowledge may lead to investment projects that are not tailored to local conditions and/or the expectations and capabilities of its end users. Solutions applied without in-depth analysis of non-technical factors and without thorough consultations with the local community often fail to solve a problem. Far from it, they may generate further problems. Therefore, involving all stakeholders in the process of municipal management planning increases the chances of generating common acceptance for a proposed solution. This has a massive impact on the flow of the process, its implementation, and on compliance with agreed rules of conduct and the correct use of facilities.

This is why countries with well-developed and well-grounded democratic traditions place strong emphasis on social participation in municipal management, project planning, and implementation processes. This is reflected in legislation regulating different aspects of public utilities management. For example, the EU's Water Framework Directive pays special attention to social aspects of the process and particularly to the participatory planning processes regarding water management in river basins. In the Nordic countries, where both the civic participation and trust in local authorities remains high (see section 15.3), the practice of participatory decision making is far from unusual

and has become a widely accepted norm in the provision and management of public utilities.

Vadsbro in Sweden serves as one of the many examples of good practice here. Vadsbro is a small rural village, consisting of 40 households (approximately 125 inhabitants), where in 1990, a decision was made there to upgrade and modernise the waste water management system. Local authorities carried out a comprehensive decision making process, which included a strong element of social participation that involved the local community, environmental protection services, and representatives of technical companies (offering a variety of technical solutions to the problem). The process begun with defining key specific expectations of the proposed system as follows:

- financial: the upper limit of the total investment and operating costs had been specified (what is interesting is that a limit of 400 kWh had been set on the annual consumption of electricity and/or heating oil per capita);
- performance: absolute system reliability and the comfort and sanitary safety of its users were identified as key factors here, however the desire to reuse nutrients was also identified (nutrient retention in the local economy);
- environment: minimum requirements for the treated matter have been set, including the minimum levels of individual indicators' reduction (BOD, phosphorus, and nitrogen) and for its bacteriological safety;
- and monitoring, including the division of responsibility.

The process continued with the creation of an inventory of available technologies (together with their specific characteristics). These solutions could be separated into two groups as follows:

- treatment at source (four different configurations for the separation of waste water and sewage, together with the use of those in agriculture and with the local treatment of remaining residue);
- and end-of-pipe technologies (six different options for bulk wastewater treatment some of which had been connected for the use of agricultural waste or sludge).

A comparative assessment of the different options was made, based on the compiled list of criteria (expectations), then final decisions were made and the construction phase begun. To those interested in what happened next, which alternative was chosen and how the process of implementation took place, see the publication by Ridderstolpe (2001) on 'Wastewater treatment in a small village: options for upgrading'. This left no doubt that the Vadsbro example could serve as a valuable source of inspiration for this type of planning process in Poland (and not only in relation to small towns).

Of course, the planning and conducting of the participatory decision making processes regarding all issues, including those of municipal management, requires special treatment and effort which adds to any project work load. Certainly, this is not an easy task, especially in a country such as Poland where more often than not the will to include local communities in the process is limited and the level of trust among them and their relationship with local authorities is poor. Therefore this requires many things including: patience, long-term cooperation, sensitivity to needs and concerns of local communities, adaptation to the direction and dynamics of social processes with an in-depth knowledge, a sound understanding of local situation (including relations between different stakeholder groups), and the ability and will to communicate objectives clearly in advance.

The involvement of a variety of groups in the decision making process (including local communities and authorities, educational sector representatives and NGOs) is

likely to benefit the quality of decisions made. This allows for a better inclusion of economic, environmental and social factors without risking over-emphasis on any one of these three pillars of sustainable development. Each person and each stakeholder group brings to the process a different pool of knowledge and experience which helps avoid the omission of important factors influencing any given situation. The experts (scientists, representatives of local administrative structures etc.) contribute technical data, conduct calculations, research the nature of different processes, and ensure that the correct methodology is being used. The local community and the scientists together bring in knowledge gained through first hand experience, partially based on familiarity and understanding of the historical context, local lifestyles and traditions. What is more, each participant contributes to the process their own values and moral norms (for example respect for the environment, local traditions and cultural values). These are based on those values and norms whereby the participants can decide whether they perceive a proposed solution as a good one.

12.6. Summary and conclusions

Employment of the various solutions and tools available is necessary for local authorities to implement provision of sustainable public utilities and management systems. As in any other area, here too there is no single best and universal solution. Only the creative and conscious linking of different solutions and technologies may result in the creation of a sustainable system. This system must be adequate for: the locality (with all its characteristics), its topography and technical conditions, as well as the local community's expectations and the capacity of the system's financial recipients.

The aim of this chapter was not to present all available technical solutions, which would be difficult in the space available. Rather, this chapter was aimed at presenting a variety of alternatives (and providing brief characterisations of the most interesting). We hope that the schemes and ideas illustrated here will serve as an inspiration for further research and implementation of decision making processes that involve both representatives from the local authorities and the local community. In this case, further and more detailed information can be found in the practical resources outlined below and in the bibliography accompanying this chapter.

Practical resources

Bodik, I., Ridderstolpe, P. (2008), *Sustainable sanitation in Central and Eastern Europe: addressing the needs of small and medium-size settlements*, Bratislava: Global Water Partnership Central and Eastern Europe. A publication in which the current state of water and wastewater management structures is outlined in a holistic and comprehensive way, describing a whole range of available solutions (with their pros and cons).

Lenartsson, M., Ridderstolpe, P. (2001), *Guidelines for using urine and blackwater diversion systems in single-family homes*, Uppsala: Coalition Clean Baltic. A practical guide that helps choose the appropriate sewage and wastewater treatment units for individual households.

Ridderstolpe, P. (2004), *Sustainable wastewater treatment for a new housing area: how to find the right solution*, Uppsala: Coalition Clean Baltic. This report describes the method of open wastewater planning applied to the development of a new housing area, in the countryside near Lake Mälaren, Sweden.

Questions

1. What actions consistent with the 3R rule are being undertaken within the waste management system in your community? What actions can and would be worth considering?
2. Do you know of any towns or businesses which are completely waste-free? Do you think this is practically possible?
3. Do you know where your tap water comes from, and what happens to your sewage?
4. How much water is being used in your household? What are the most water-consuming activities within your household?
5. Plan for a concept house which would not be connected to the water supply nor the sewage network.
6. Assuming that the quality of your tap water is consistent with current standards and regulations would you agree for your tap water to be produced from: a) stormwater; b) grey wastewater; or c) municipal wastewater?
7. Plan a campaign to promote separating toilets within your community.
8. Which of the solutions presented in this chapter would be most applicable and worth implementing for water/sewage management system in your town/village? Based on your choices try to build a coherent, integrated system to serve the needs of your town/village.

Case study 12.C1.
Wastewater treatment plant for Dziewin

The example of Dziewin and the way in which it has tackled the problem of sewage and wastewater management is a very interesting participatory (involving all stakeholder groups) decision making process in municipal management. Another interesting aspect of this example is its portrayal of the way in which alternative solutions can be applied to sewage and wastewater utilisation and its management in small towns and municipalities. In this particular case, the alternative solution in question was constructed wetlands.

This project described below in more detail was developed and implemented by the Centre for Systems Solutions, in collaboration with the Sendzimir Foundation, Fundacja Zielona Akcja (the Green Action Foundation) and the Central Odra Valley Partnership. Other important partners included: local authorities from Dziewin itself, the town and municipality authorities from Scinawa, and AGH – the University of Science and Technology in Krakow. The project was co-funded by the Regional Fund for Environmental Protection in Wroclaw.

Dziewin

Dziewin is a village with about 150 residents located in the Lower Silesia province, approximately 5 km from the town of Scinawa. In 2003, the village was connected to the water supply pipeline owned by the Scinawa municipality, however, just as most villages in the Polish countryside, Dziewin did not have its own sewage system and there are no plans to create one over the coming years. This situation has had a negative effect on the quality of life of Dziewin's inhabitants. This also poses a threat to the natural environment and has had an adverse effect on the region's ability to attract tourists. This last factor is crucial here as the area is rich in natural resources, most important of which is the Odra river bed with alluvial forests unique in Poland (a Natura 2000 area). The village does benefit from an exceptionally active community affiliated under the Central Odra Valley Partnership, the body which organises open-air painting and sculpture events and a variety of festivals. 'Dziewin's Development Plan' provides documented evidence of their support. The document was prepared by Dziewin's inhabitants themselves, assisted by external consultants and moderators, and its content included the question of sewage and wastewater management, proof of the significance that this problem has in the minds of village's residents.

The first workshop

Two workshops brought together more than a dozen students of different disciplines from all over Poland, along with Dziewin's residents, and representatives of the village local authorities, to provide key elements for the project. The first workshop took place in April 2006. In the course of the workshop a series of talks were given on the subject of sewage and wastewater treatment along with presentation of the solutions and technologies applicable to Dziewin (i.e. a centralised sewage drainage system, and centralised or household constructed wetlands). The single most important element of this workshop was, however, the comprehensive, holistic analysis of the proposed solutions. In this analysis, supported by the students, the residents made financial costing calculations for both the investment and the operation phases of the project (see table 12.3). Comparative analysis of the impact that proposed solutions might have on the natural environment, the local economy and the quality of life for inhabitants was also completed.

Table 12.3. Financial analysis of the construction and exploitation costs for constructed wetlands and connection to a collective wastewater treatment plant in Scinawa (amounts given in PLN, correct for the year 2006)

Proposed solution		**Investment costs**	**Monthly exploitation costs per household**	**Total monthly exploitation costs**
The costs of connection to the conventional wastewater treatment plant in Scinawa		1,500,000	45	2250
Constructed wetlands	collective plant	268,000	30	1500
	sewage system within the village	700,000		
	Total	968,000		

A public debate attended by a large number of the inhabitants culminated and completed the first workshop (figure 12.12). Present at the debate were also representatives of local authorities (including the mayor of Scinawa and Dziewin's village administrator, among others), as well as students, instructors and course organisers. The results from the two day long workshop were presented during the debate the results of which were then discussed in detail in a public forum. The discussion itself was led by an independent moderator.

As shown in table 12.3, the use of constructed wetlands means lower construction costs (mainly due to the shorter and simpler sewage system located within the village without having to be connected to the plant in Scinawa) and lower costs associated with the subsequent operations and necessary upgrades of the facility. Besides that, some work can be done in-house by the villagers.

Figure 12.12. Public debate in Dziewin (22nd April 2006)

Environmental, technological and social aspects

Presented below are the key observations and conclusions regarding the non-financial aspects of both the considered solutions. They were formulated during the workshop and debated by the participants.

1. The main objective for the construction of the facility is the need to solve the sewage problem in Dziewin. Joining the central plant in Scinawa has been planned for ten years from now. This process is likely to bring substantial costs as well as technological and organisational difficulties associated with the construction of an extensive sewage system. Constructed wetlands can be built within two to three years (note that this is a period that cannot be shortened due to formalities on the necessary alterations in local spatial planning regulations).
2. Aside from the treatment of the municipal sewage, the planned facility may also be used to serve different functions. It will enable a range of educational activities and workshops to take place around the constructed wetlands and generally on water management. The producers of sewage rarely realise what happens to their waste after the toilet is flushed. Environmental awareness is likely to increase as a result of direct contact with the facility.
3. The site will also become a model facility which may be visited by guests from other towns and villages interested in investing in similar treatment plants.
4. The constructed wetlands will also complete the image of Dziewin as a village which follows the sustainable development paradigm and invests in environmentally friendly solutions. This way the plant might contribute to the village's promotional efforts. A facility of this kind can also become a tourist attraction attracting tourists to the application of environmentally-friendly technology itself as well as to the variety of the village's flora.
5. Hourly and daily flow fluctuations of sewage are common in small towns and villages. What is more, rural tourism activities which are developing in Dziewin result in an increased volume of sewage at certain times of year, such as summer or Christmas holidays. Constructed wetlands are much less sensitive to these variations and can even survive a period of no sewage inflow. Facilities of this kind can also be easily expanded if the need arises.
6. The environment also benefits from this solution as follows: wetland ecosystems are created which can become a comfortable habitat for a variety of plant and animal species. Sewage decomposition processes are fully natural and so wastewater does not endanger the environment. Moreover, such treatment plants prevent local water shortages and increase local water retention having a positive impact on the hydrological cycle of the region. A treatment plant of this kind is also a welcome addition and an aesthetic element within the landscape.

These observations and conclusions presented above are characterised by accurate specifics and a holistic approach to the problem. A great majority of these are supported by the findings included in both the Polish (Heidrich and Stańko, 2007; Gajewska and Obarska-Pempkowiak, 2008), and foreign academic literature (Vymazal, 2005).

Table 12.4 was created during the debate by participants who discussed the pros and cons of both solutions considered. Specific decisions regarding sewage and wastewater management in Dziewin were made based on this table. The constructed wetlands were chosen as most appropriate for this particular locality. A decision was also made to construct an aggregate, cumulative treatment plant. All sides of the debate announced their support for this solution and expert and financial engagement was declared for the continuation of the project.

Table 12.4. The pros and cons of the possible solutions to the sewage problem in Dziewin (according to the participants in the public debate)

CONSTRUCTED WETLANDS	CONVENTIONAL TREATMENT PLANT
PROS	
– Lower exploitation costs – Tourist attraction – Pro-ecological solution (lower negative environmental impact) – Pretty – Possible use of fertiliser and water – Possible use of energy willow – Improved water quality in Napoleon's lake – Short time of implementation (the village will be the first one in the region to solve the problem and use constructed wetlands) – Work place for one inhabitant – Possible use of the inhabitants own work – Easy access to funding (innovation) – A chance to gain access to the municipality funding – Municipality may appoint a surveyor offering good terms	– The treatment plant already exists (there will be no problem with acquiring an appropriate site) – Inhabitants' involvement is not a necessity – Increase in municipality's income – Possible employment for one person (in a pumping station) – Improving the efficiency of existing wastewater treatment plant (reduction of fees paid by its current users)
CONS	
– The necessary site for the treatment plant (problems with land ownership) is located 100 meters away from buildings – Possible conflict amongst the inhabitants (whose land, access road – easement) – High connection charges – Necessary changes in the spatial management plan (long-term process)	– Energy intensity – Investment planned as the fourth stage of implementation process (in some 10 years) – High exploitation costs – High connection costs

Public opinion and the second workshop

Participants in the first workshop created a questionnaire asking about the current status of sewage and wastewater management in Dziewin. On the 22nd of July 2006, two pairs of students visited all the surveyed households. They conducted interviews based on people's responses to the questionnaire, and handed out short information packs about the planned treatment plant. As a result of this research (in addition to maintaining contact with Dziewin's inhabitants and having a chance to address and resolve their

doubts and concerns) data regarding the volume of water used and sewage produced was gathered, this data was invaluable for the second workshop (September 2006). During the second workshop a detailed concept for the treatment plant was discussed with its size estimated at 2000 m^2. Optimal location for the planned investment was also chosen on low-quality, but well-located (lower than most buildings) soil, right outside the boundary of the housing area (see figure 12.13). Furthermore, the site's owner agreed to allow access to and the use of his land for no fee. Solid foundations for the continuation of the project were also set including a detailed action plan involving all stakeholders. A decision was also made regarding the construction of a show-plant (the size of which was to correspond with the size of an individual household treatment plant) for the new community centre (currently under construction).

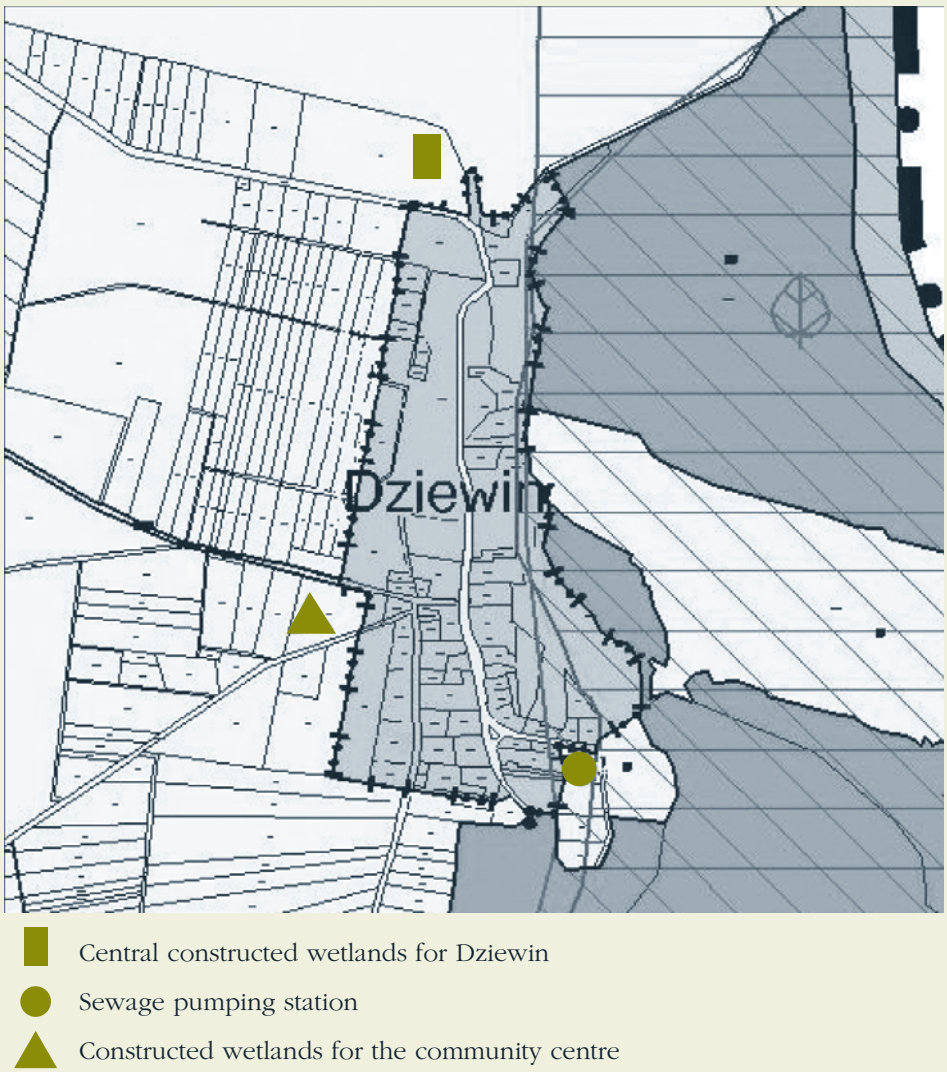


Figure 12.13. A map representing the conclusions to the second workshop (Damurski et al., 2007)

Conclusions

The decision making process proved to be a large success for this project. Despite the specialised and seemingly unattractive topic of the project, active and high level of stakeholder participation was achieved. A few factors contributed to this result, and the most important of which were:

- the project was co-organised by an NGO with long-term involvement in the local area, recognised and trusted by local partners;
- active involvement of all interested stakeholders;
- very open but at the same time the very decisive attitude of local and municipal authorities;
- the widespread and up-to-date activities of inhabitants with a rich history of previous collaborations between them; and
- the local leader and village administrator Joanna Mostowska, whose personal involvement in the project inspired others to also become actively involved.

As it turned out, due to the numerous and representative stakeholder involvement the discussion was carried out to a very high level. Together, the expert knowledge, practical experience and familiarity with and understanding of local as well as legal and financial conditions led to accurate decisions being made that contributed to Dziewin's sustainability.

The project will continue in the form of an investment phase in which the planned constructed wetlands will be built. Unfortunately, at the time of writing the process had slowed due to political changes after local elections in which a new mayor of Scinawa was elected. However, once they familiarised themselves with the solution chosen, the new authorities expressed their interest and will to proceed with the project's implementation in line with the previously made decisions and plans.

Questions

1. Do you think that the inhabitant involvement in municipal management planning is possible in your town/village? What conditions would have to be met?
2. What actions could be taken to aid the effective fulfilment of the objectives and conclusions arrived at in the project described in the case study above? Construct a strategy (including a timetable for its implementation).
3. Can you see the positive feedback loop (see chapter 2) between the level of social development and the level of environmental protection in a given community? Name the factors for strengthening this loop.

Chapter 13.

Public-private partnership

13.1. Introduction

Public-private partnership (PPP) is a term that has been appearing increasingly often in discussions on financing municipal infrastructure, and public investment in general. The idea of PPP has been promoted not only by the European Commission, but also by other international institutions, such as the World Bank, the OECD and the EBRD. The Polish government passed a subsequent amendment to its 2008 Act on PPP, the amended act coming into force at the beginning of 2009.

The theory of PPP and first and foremost its long-standing use in a number of countries prove that thanks to implementation of PPP policies, public bodies can respond faster and more efficiently to the expectations of society. However, if this is to be the case, certain conditions regarding project/public ventures and the nature of their partnerships need to be fulfilled. Because the services described in the three previous chapters can be conducted within a PPP framework, in this chapter we analyse the essential criteria that are needed for society to benefit from PPP.

In section 13.2, we present the theoretical and historical considerations concerning the reasons for public body interest in PPP. We outline the basic characteristics of public services that can be performed in cooperation with private companies. Although our reflections can be supported by examples of partnerships in numerous domains, we focus our attention primarily on those related to sustainable development.

In section 13.3, we highlight the actions necessary to establish good and fruitful cooperation. We refer to Polish regulations on PPP and broadly speaking refer to the possibilities for cooperation between public (mainly municipal) bodies and private companies.

To illustrate these points, we take a close look at an example of a PPP created by the Lidzbark District to construct and manage a leisure and spa centre, which uses geothermal waters (see case study 13.C1).

13.2. PPP as a way to better public service performance

Public-private partnership can be generally defined as cooperation between public bodies and private companies to carry out public services (Zysnarski, 2003; Akintoye et al., 2003). The private company's responsibility for assets necessary to execute a given service and the scope of this responsibility constitute a significant element of the partnership (figure 13.1). Scenarios can vary, ranging from situations where a private company is just a service provider using its own assets (for example transport services), to the handover of public asset administration (for example in water and sewage services when a private company becomes responsible for service provision, via a lease of the public sewer network). Finally, a private company can become the owner of public assets for a given period, either as a result of creation of a company together with a public body (a partial privatisation of the existing public assets), or as an outcome of newly created facilities.

This last option is a classical example of a PPP with all the potential advantages of the process. A private company constructs or reconstructs infrastructure to then

administer it later on. On termination of the contract, the public sector then becomes the owner of the infrastructure. These processes are known as either Build Operate Transfer (BOT) and Rehabilitate Operate Transfer (ROT). On the one hand the end points of our classification are classical service and asset provision by a public body, and on the other total privatisation with a private company being fully responsible for assets and services (Kopańska et al., 2008, pp. 11–12).

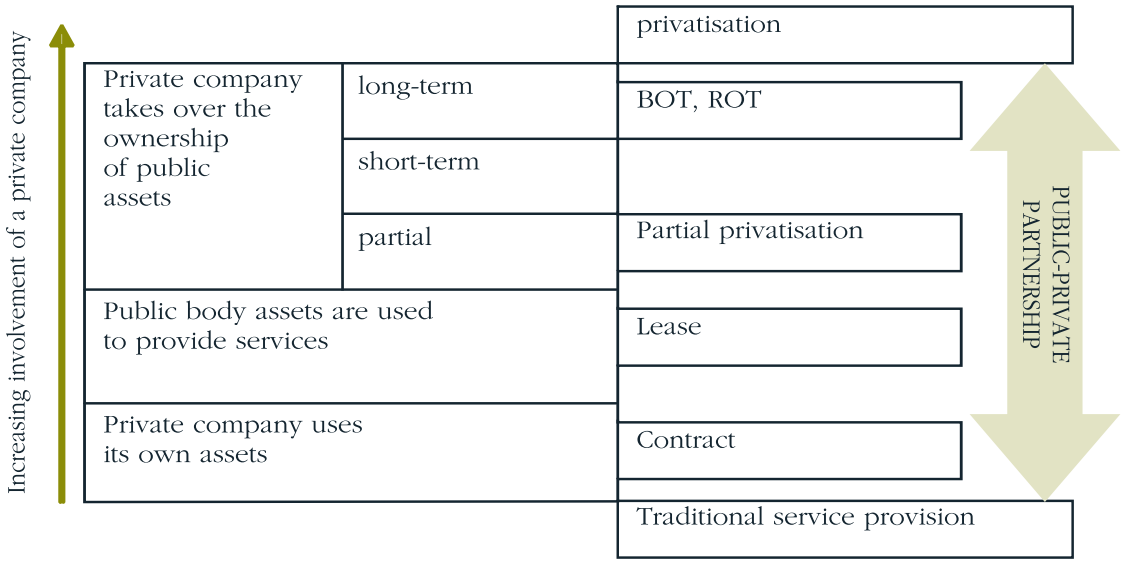


Figure 13.1. Forms of PPP and their relation to ownership and public infrastructure management (adapted from Akintoye et al., 2003)

13.2.1. The use of PPP

The history of PPP goes back a long way, the drainage of the area of Dystos lake from the 5th century B.C. executed for public benefit by a Greek engineer Chairephanes provides one of its earliest examples. In return for his services, the engineer was granted right to farm the drained land and he was exempted from paying taxes (*Forbes*, 31.05.2007). The modern history of PPP commenced in the 1970s when the inefficiency of the public sector was becoming plainly visible. The nationalised/monopolist public sector was not transparent to citizens and its operating costs were constantly increasing. These problems were aggravated by the Oil Crisis, which brought about the crisis in public finances that was followed by a dramatic increase of public debt and limitation of public sector investment capabilities. Therefore, a search for new ways of non-budgetary infrastructure and public service financing began.

PPP could also be perceived in the broader context of public administration reform (New Public Management, NPM). The idea of the reforms was to unleash market forces onto the public sector in order to increase its efficiency. As a result, private companies were allowed to compete for public services (see Vaillancourt-Rosenau, 2002, p. 4; Brzozowska, 2005, p. 20).

Today, PPP is regarded solely as one of many forms of partnership formed by public administration to improve the quality of performed services. The specific character of public activity requires the wide involvement of those in society and its representatives in its administration. Consequently, the public sector can forge social partnerships with the social sector (non-governmental organisations). It is thought that while PPP improves

the supply of public services (as we shall see in the following subsection), social partnership is a basis for better assessment of society's demand for these public services. This is due to the fact that participating citizens, in contrast to those who remain passive, show their preferences regarding the goods and services offered by the public sector (Frey and Eichenberg, 1996).

PPP has become its most popular in Anglo-Saxon countries, namely Great Britain, Ireland, Australia, Canada and the United States. Nevertheless, in other developed countries PPP is thought to be a significant (but not the only) method to operate public services. First of all, after years of experience and analyses of both successful and failed PPP ventures, it was highlighted that certain conditions needed to be fulfilled, if PPP was to be more effective than other approaches to the performing of public services. These conditions include:

- competition between private companies bidding for a project;
- risk allocation between partners;
- the possibility to evaluate the effects of a project; and
- the possibility to generate revenues connected with the project's effects.

13.2.2. Benefits connected with PPP

One of the most important arguments for private sector engagement in public service provision is its ability to make better use of resources, compared with its public counterparts (Shirley and Walsh, 2000). A basic condition for efficiency gains in the performance of public services is competition between companies (consortia) competing for the public service contract. In other words, it is necessary to have numerous private companies in the marketplace that are capable of performing a given service thanks to their previous experience in similar undertakings.

At this point, it can be noted that the traditional public contract procedure is also characterised by competition for a project. For example, a private company is hired to carry out for example a construction investment (see figure 13.1). A PPP has the advantage over the traditional solution because private companies in a PPP share responsibility for other phases of a project as well, so they become responsible for the whole of a public service, not only a component of it. When a private company is involved in the entire project, it is managed like a private venture (which, according to classical economic theory, is more effective) (Grimsey and Lewis, 2005, p. 374).

The existence of private companies experienced in similar ventures provides another important advantage of a PPP over the provision of service by a public body. In many instances, projects undertaken by public sector entities are unique, one-time ventures, with good examples including a new sewage treatment plant, a wetland construction or city revitalisation. These are services performed by a given local authority entity only once in a decade or every thirty years. Consequently, public officials have no experience with these kinds of project. On the other hand, private companies operating in many markets that are both internal and external, and public and private can bring in adequate know-how. Additionally, they can leverage the effects of scale, unattainable for a single local authority unit.

PPP projects executed in water and sewage services serve to illustrate this. In these projects, multinationals operating worldwide often become private partners. Each of these companies supplies millions of people with water (for example in 2006 Suez supplied 98.2 million people, Veolia – 115 million and Saur – 13.6 million). Partnerships with smaller, local companies can be equally successful at taking advantage of a PPP

which is common in water and sewage services. Still, local companies are usually hired for projects of less value, which are not connected with investment. In this case, a local private company is entrusted with administration of public assets, for example, in France just three private companies operate and dominate this market, with another 50 smaller companies only accounting for 2% of the PPP market. A private partner's participation in all phases of a project (from design to exploitation) does not mean that the private partner should be solely responsible for a venture. However, handover by public sector representatives of overall responsibility and, by the same token, the whole risk linked to the project to a private company can be tempting. Nonetheless, such a solution could be costly and ineffective. Proper risk allocation, sharing services and responsibilities between private and public bodies, is believed to be a fundamental factor in PPP in ensuring the benefits are in the public interest. This is due to a synergy effect where each partner is more efficient than the other managing certain types of risk associated with a given public service.

13.2.3 Risk management

Risk management is a challenging issue in any project and in practice it is often done rather intuitively and unconsciously. However, in case of projects in a PPP framework, this issue becomes especially important. There is no single detailed model for optimum risk sharing, and each project calls for its own appraisal. Nevertheless, it is worth referring to guidelines concerning risk allocation in PPP projects issued by Eurostat (2004). These guidelines were provided to establish whether liabilities resulting from a PPP agreement should be calculated as part of public debt. It was agreed that when the majority of construction risk, availability risk and demand risk is transferred to a private company then the liabilities are not treated as public. In general, it can be assumed that construction risk should be allocated to a private consortium usually represented by construction companies, specialised in the field of construction. This assertion holds true for every infrastructure venture. However, the allocation of availability risk, connected with the services dedicated to constructed buildings, alongside the allocation of demand risk are far more complicated. Examples of risk sharing for different projects are shown in table 13.1.

In a PPP risk analysis we need to particularly emphasise political and social risks. The risk of lack of social acceptance can result from the fact that projects might encounter social opposition, for example when a previously free service becomes chargeable. Social opposition might also have its source in an irrational fear of a PPP, as a PPP is sometimes perceived as privatisation or a sign of blurred connections between public and private sectors. This is connected to political risk where opinions expressed in the community can lead to changes in political decisions. That is why a PPP needs to be created in cooperation with the community. Consequently, a PPP must be a transparent process that the community is able to understand. Therefore, social consultations are important, especially those taking into account opinions of the group most concerned with the process notably public officials. For education programs these are teachers, and in health care projects, they are doctors. Consultations should play a special role in revitalisation projects or undertakings similar to those of PPP programs connected with natural resources management as described in subsection 13.2.4. The community and its organisations become partners in such projects when they participate in the decision making in subsequent phases of the project's life cycle.

Table 13.1. Examples of risk sharing in PPP projects in Europe (EC, 2004; Edsall, 2005; NAO, 2005; Transport for London <www.tfl.gov.uk>)

Sector	Partners	Project description	Risk sharing*
Public transport (underground: maintenance and infrastructure development)	Public: London Underground Limited (UK) Private: a few consortia responsible for different underground lines (Metronet, Tube Lines)	Aim: maintenance, renovation and underground infrastructure development (tunnels, lines, stations, rolling stock, etc.) Form: 30-year licence	Construction (in this case reconstruction, renovation, development): public and private consortia (payments for undertaken actions are agreed every 7 and half a year and included in contracts together with a penalty mechanism for inadequate fulfilment of responsibilities) Demand: the public body remained responsible for underground exploitation and management Availability: a system of penalties and payments for the lease of assets is similar to the one for renovation and development
Health care (hospital construction)	Public: National Health Service (NHS Trust) Dartford and Gravesham (UK) Private: consortium managing the hospital also including a public body (THC Dartford)	Aim: Construction of a new hospital of 400 beds in Darent Valley Form: 35-year contract as a part of PFI – a British infrastructure financing programme (kind of BOT)	Construction: private (public bodies participate in this risk proportionately to their share in the consortium) Demand: public – NHS Trust is responsible for medical services in the hospital Availability: shared: private contractor – non-medical services (catering, cleaning, washing); public body – medical
Education (schools construction)	Public: authorities of New Brunswick Province (Canada) Private: Diamond Construction Ltd.	Aim: construction of a new school building in Fredericton Form: BOT, license for 20 years	Construction: private (the private company built the school according to specification of the public body that became the owner of the buildings) Demand: public – responsible for education Availability: divided: private company – services and building maintenance; public body – provision of educational services
Water and sewage (sewage treatment plant construction	Public: Dublin municipal authorities (Ireland) Private: consortium consisting of Ascon, Black & Veach and Anglia Water	Aim: construction of a sewage treatment plant in Dublin Form: BOT agreement for 20 years	Construction: private, half of the investment financed by EU grant Demand: public body responsible for collecting charges from citizens Availability: private – responsible for maintenance and operating the sewage treatment plant

* Risk sharing is described in the table according to initial wording of the contracts. Later amendments to some of the projects are not taken into account.

Proper risk allocation is a decisive factor for the success of a PPP project. However, risk sharing is not possible if there are problems with measurement and assessment of particular cycles of project life and their effects. This is another condition to be fulfilled by PPP initiatives and selecting clear indicators is essential for the engagement of a private company. The public body must prove that a private company's involvement will generate greater benefits than any other approach to provisions of a service. Subsequently, we need to compare the Economic Net Present Value of different organisational solutions (this is why economic analyses in PPP projects are often referred to as comparative analyses or PPP comparators).

Additionally, if a PPP is to bring benefits related to efficiency gains mentioned in subsection 13.2.2, the private company should include the public body's expectations in its analysis of investment efficiency (financial analysis). It is worth mentioning that through this mechanism PPP may be more efficient than an ordinary contract. In traditional public procurement, a private company receives a technical specification for expected facilities. In a PPP, the private company receives information about the effects expected by the public body, such as the quality and characteristics of a given establishment. As a result, private companies can decide the technical details where their ideas may be more efficient and innovative, especially if such companies are going to be co-responsible for exploitation of the facility as well (see the Amsterdam revitalisation project described in subsection 13.2.4). Furthermore, clear indicators of the project's effects are essential in enforcing a contract with a private company. These indicators are used to monitor and influence a private company's operations early in the process of a PPP's implementation.

Last but not least, analysing projects with respect to PPP implementation, we need to remember that creation of a partnership is based on the interest of both parties. From a private company's point of view, the possibility for making a profit is their main motivation and possible profit can be associated with sales mechanisms used in a given market that define the customer base and pricing possibilities. For example, in the water and sewage sector, a company can profit from the water and sewage charges collected from citizens. In case of revitalisation or social housing projects, a private company can generate income from sales or rental from parts of the premises. In health care or educational projects, a private company's income is made from the public body's payments to them for exploitation and maintenance of facilities, and often for leasing of buildings and equipment.

In comparing the traditional investment approach using public resources only with a service carried out via PPP system, or even to compare different PPP solutions, we can use Cost–Benefit Analysis (CBA) approach. In a CBA, we contrast the Economic Net Present Value (ENPV) for different solutions and chose the one with the highest, positive ENPV (Kopańska et al., 2008, pp. 27–39):

$$ENPV = -\sum_{i=0}^{n} \frac{IC_i + EC_i + Ext_i}{(1+r)^i} + \sum_{i=1}^{n} \frac{\Pi_i}{(1+r)^i}$$

where:
ENPV – Economic Net Present Value;
IC_i – investment costs in year *i*;
EC_i – exploitation costs in year *i*;
Ext_i – external costs in year *i*;
Π_i – social benefits (private and external) in year *i*;
r – discount rate.

In PPP infrastructure projects that necessitate financing with loans, this is often needed to combine two or more sources to complete the budget. Alongside classic loans and credits taken out on a project by both parties (or, in most cases, principally by the private partners), other financial instruments can be used. One of these is a mezzanine debt secured not by assets but by cash flows for example. This type of debt can manifest itself in various forms, for example revenue bonds. Thus, various debt instruments can finance 70–80% of an infrastructure PPP project. Additionally, partners need to make their own contributions, and whilst cash contributions are rare, share capital, equity or in-kind contributions are more common.

13.2.4. Examples of PPP implementation in the context of sustainable development

Spatial planning: Oosterdok Island, Amsterdam[1]

In the centre of Amsterdam, Oosterdok Island comprises of 220,000 square metres with the area once occupied by a postal sorting office. As a result of a PPP formed with a dozen of developers and municipal authorities, the island was transformed into a modern, fashionable district. Municipal authorities bought the land from its previous owners and gave it in the form of long-term lease to developers with the authorities reserving the right to influence the spatial planning of the island. In the project, returns on investment would stem from significant increase of land and property value due to the island's revitalisation.

The first designs were prepared in 1995 and in 2007 the first building, a public library, was completed. In 2000, while designing plans for the facility, the municipal authorities adopted ambitious guidelines for its energy efficiency with the design created in cooperation with international architectural companies. Stringent standards for energy efficiency were agreed upon (10–30% more demanding than the norm). It was possible to meet these requirements due to unique ventilation technology, hot and cool air filtering systems, innovative lighting solutions and the use of solar energy. Furthermore, the cost of these state-of-the-art solutions was no higher than standard technologies (see chapter 6). An interesting organisational method for the PPP contract division was implemented in this case with private companies operating the heating and cooling system according to the PPP contract for service provision at the same time that the library building was constructed and maintained in accordance with other PPP contracts.

Natural resource management: Chesapeake Bay, the United States[2]

Chesapeake Bay, located between Maryland and Virginia, is the biggest estuary in the United States. In the 1980s and 1990s, the bay was subject to constant degradation caused by an uncontrolled increase of municipal and rural sewage. The public authorities, both local and regional, did not have the funds or technical abilities to prevent the degradation.

A solution came in the form of PPP agreements that were concluded in 1999 when a private company was granted the right to log forests in a designated area in the vicinity of the bay. In return, the company undertook administration of the whole Chesapeake Bay area, operating under strict control of the Maryland Forest Service. Environmental NGOs also involved in the project developed a plan for the regeneration of the Chesapeake Bay. Among other things, they chose those forest areas where logging would cause the least harm to the ecosystem. Creation of the Chesapeake Bay Advisory Committee was an important step in the way towards this partnership. The advisory

[1] See <www.urban-matrix.net>.
[2] See <www.ncppp.org/undp/chesapeake.html>.

body participated in the creation of an action plan and the forest management procedures. This included citizens and representatives of the local authorities and private companies from the Chesapeake Bay area.

Municipal services: water and sewage sector in Poland

In Poland, there are only a few examples of agreements between communities and private companies stipulating that they are responsible for supplying water, and wastewater collection and treatment (Kopańska et al., 2008, pp. 155–161). Whilst there are no Polish examples of an infrastructural PPP in this sector, there are two examples of partnerships, which demonstrate the capacities and potential of a PPP. Additionally, they prove that a PPP can be created both with a large firm and a small local enterprise.

The first example is the collaboration of the Gdańsk authorities with an French company Saur. At the beginning of the 1990s, the Gdańsk sewage network faced numerous problems, such as low water quality, frequent network failures due to poor maintenance, significant losses of water, and closures of Gdańsk Bay beaches resulting from inadequate sewage treatment. Because the municipal authorities did not have sufficient funds to amend the situation, in 1990, representatives of Saur suggested a partnership. Negotiations lasted over two years, but in July 1992 a joint venture, Saur Neptun Gdańsk SA (SNG), was created. The shareholders of the company were the Gdańsk municipal authorities (49%) and the Saur group (51%). The municipal authorities contributed assets for water and sewage services (equipment, vehicles, administrative management buildings and their grounds, but not the infrastructural construction). The French partner contributed funds which were spent on the development of the newly-created company (as they could not be spent on municipal infrastructure investment). As stipulated in the contract, SNG, a company specialising in exploitation of water and sewage infrastructure, was entrusted with service provision for the municipal authorities. SNG was to provide collective delivery of water and collection wastewater for a period of 30 years, using the water and sewage network belonging to the municipal authorities. In 2005, the structure of the partnership was modified when the municipal authorities who had owned the infrastructure, decided to create Gdańska Infrastruktura Wodociągowo-Kanalizacyjna Ltd. (GIWK), in which the urban community of Gdańsk was the only shareholder. The infrastructure used by SNG was transferred to the new company. Consequently, relations between the parties of the PPP were changed. SNG, still bound by its agreement with the municipal authorities concerning water and sewage services, had to sign additional lease agreement with the new infrastructure owner, GIWK. After over 15 years of cooperation, the partnership is regarded as successful. What is most important, thanks to this partnership it was possible to solve all of the water and sewage network problems in Gdańsk mentioned above.

In another example, the development of Piaseczno in the Greater Warsaw area was closely linked with the development of the city itself. In recent years, the number of Piaseczno's inhabitants has increased resulting in a need to for more water. Moreover, both municipal authorities and the community are obliged to carry out water and sewage investments connected with the EU accession requirements. In 1992, the community of Piaseczno took over the ownership of the water and sewage network together with the sewage treatment plants from MPWiK Warsaw (the City Water and Sewage Company) and established its own Gminny Zakład Gospodarki Komunalnej (a Municipal Public Utilities Company). However, this organisational framework proved to be ineffective and incurred a significant deficit. In November 2003, a ten year contract was signed between the community and two

private companies, Aquarius and Elmar. According to the agreement, the two private companies were allowed to provide water and sewage services (Aquarius to urban areas, and Elmar to rural areas) and could employ fixed municipal assets for the purpose. The community remained responsible for the financing of water and sewage infrastructure investments. However, after one year, the period of the agreement was shortened to 2008 and the contract changed to meet the requirements of the procedures for water and sewage investment subsidies granted by the Cohesion Fund. Nevertheless, city representatives emphasised that the cooperation had positive effects. Above all, it eradicated the chronic financial deficit in Gminny Zakład Gospodarki Komunalnej (the Municipal Public Utilities Company) thereby making available additional funds for development.

13.3. Preparation of a good partnership

Public-private partnerships are often created for a decade or even decades. Long-term collaboration must be preceded by a thorough analysis and good preparation and to create a successful partnership, a series of analyses, negotiations and consultations need to be carried out.

In the following, we describe 6 steps (figure 13.2) that need to be taken to make a PPP a profitable solution for both the private and public partners (Investment Support, 2009). These steps are based on international experience with PPP, adjusted to fit the reality and legal constraints of Poland.

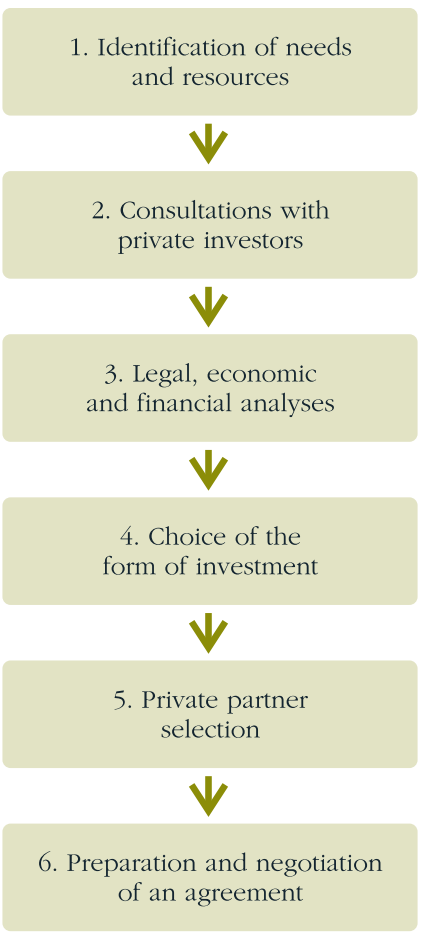


Figure 13.2. PPP step by step

STEP 1. Identification of needs and resources

It is essential for every project, whether or not a PPP, to be well designed and suited to the needs of a particular public body with its functional assumptions specified. At this stage we need to decide what is expected from collaboration with a private company. Moreover, the whole project management system needs to be planned in advance. At the end of this first step, the initial conditions for collaboration must be drafted. The conditions therein should account for possible tax and financial consequences (especially where part of a public budget), because these issues will be discussed with potential investors. The first step then is aimed at creating an initial negotiation stance in talks with investors.

STEP 2. Consultations with private investors

Already the name PPP suggests that it differs from traditional commissioning of services to a private company. In the case of PPP, the investors are expected to participate in the creation of a common project. This is why consultations with potential private investors should be the next step in the PPP building process. The purpose of such consultations is as follows:

- to receive feedback from the market on project assumptions and to verify those assumptions in real life; and
- to gain the interest of as many potential partners as possible to ensure competition for the contract.

Information on the project, including the basic legal, organisational and financial assumptions for investment, might be consulted with potential investors with the help of tools specified in the legislative Acts on PPP, Construction Service Licensing, Public Procurement, and other legal documents on procedures, organisation and practice used in investment projects.

During these consultations, it is important to ensure transparency and equal access to information on the project for all of the potential private investors. Any accusations of partiality towards one company must be avoided. A website for the venture or information on the project's progress and published via other media can help to ensure its promotion and consultations are impartial.

STEP 3. Legal, economic and financial analyses

Information on realistic expectations and capabilities of private companies gathered in step 2 forms the basis both for the feasibility study and the assumptions for collaboration between partners. Polish law provides many possibilities for creating investment projects in cooperation with a private partner (see figure 13.3). Existing legal and organisational frameworks, as well as financing possibilities need to be analysed in the process of preparation of the PPP. The purpose of these analyses will be to asses the financial and tax consequences associated with different forms of collaboration. At this point, once again it is important to confront previous assumptions (Step 1) with private the company's expectations.

STEP 4. Choice of the form of investment

Using the analysis and possible scenarios developed in Step 3, the public body must decide on the form of investment. This decision will determine to a considerable extent the private partner selection procedure (table 13.2). The next phase should consist of the preparation of a detailed decision making procedure, via which substantive offers could be made. What is important is that the agreed conditions and criteria should make it

possible for bidders to present varied offers for collaboration. This phase is thus the preparation for the formal choice of a private partner.

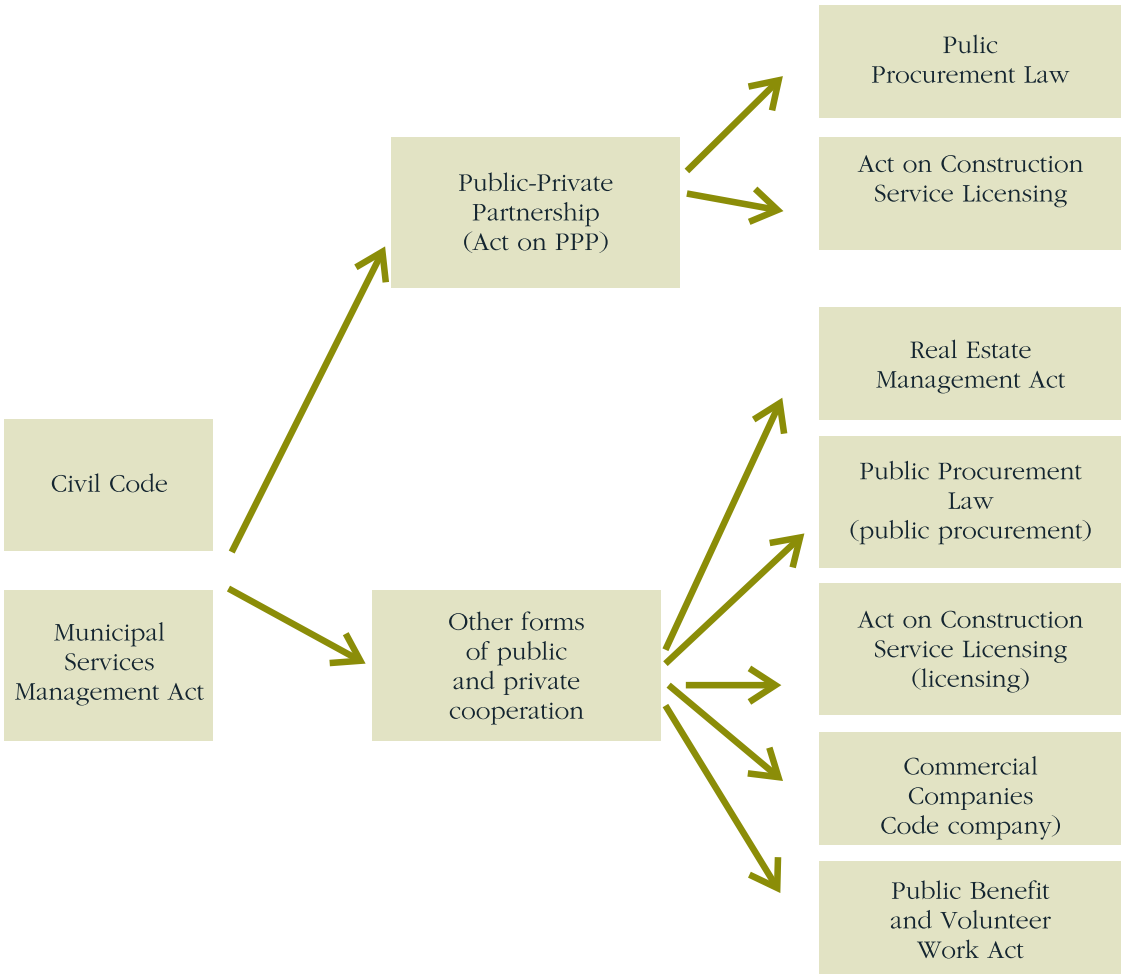


Figure 13.3. Public-private cooperation forms in Polish legislation (PAIiIZ and Investment Support, 2009)

STEP 5. Private partner selection

There are numerous procedures covered by the Polish legislation that can be used to choose a private partner. Where we are able to decide on the most suitable of these procedures, firstly, we must identify the substantial formal criteria that will be the basis for our choice. Additionally, we need to specify the rules for the assessment of bids. The former will serve to assess private companies and the latter will be used as a tool in subsequent negotiations with them.

STEP 6. Preparation and negotiation of an agreement

The last step involves negotiations with private partners and drawing up of a cooperation agreement. This is the culmination of preparatory works conducted in previous phases and the more attention that is paid to the services described in steps 1–5 the shorter the last phase will need to be.

It is worth noting that the above preparations of a partnership can last several months and sometimes even 2–3 years.

Table 13.2. Types of public-private cooperation and private partner selection procedures according to Polish legislation (PAIiIZ and Investment Support, 2009)

Act of law	Method of cooperation	Private partner selection procedure
Municipal Services Management Act	Commercial law company	Negotiations based on the provisions of the Civil Code
Real Estate Management Act	Civil law contract (for example assignment under perpetual usufruct), management contract	Tender by procedure regulated by the Real Estate Management Act
Public Benefit and Volunteer Work Act	Contract	Open competition
Public Procurement Law	Public procurement contract	One of the procedures put forward by the Public Procurement Law (for example tender, competitive dialogue or negotiations with announcement)
Act on Public-Private Partnership	Public-private partnership contract	Depends on the source of remuneration of a private partner: procedures indicated in the Public Procurement Law and the Act on Construction Service Licensing
Act on Construction Service Licensing	Concession contract for construction works or services	Negotiations

13.4. Summary and conclusions

Public-private partnership is a collaboration of public bodies and private companies based on a formal contract with the aim of providing public services. A PPP is a chance to execute those services in a more effective, faster and cheaper way. As a result, a public body can meet the expectations of society and reduce its investment expenditure. Simultaneously, it does not have to engage in long-term management of infrastructure projects. However, not all undertakings can be carried out in a PPP form. In this chapter, we explored the characteristics of public services that can be performed in collaboration with private companies. As we noted, a whole range of sustainable development projects can comply with these criteria, which include PPPs for water and sewage projects, revitalisation, social housing, education, transport, and health care. However, if a PPP is to prove successful, it must be carefully prepared, in this chapter we went through the six basic steps that must be taken to build a good partnership. Alongside legal and financial analyses, social consultations play a vital role in PPP project development. By the same token, PPP in not just a way to carry out sustainable development projects, PPP itself can become part of sustainable development.

Practical resources

<www.ncppp.org/undp> *Public-private partnerships: case studies for sustainable development*, the website hosted by the UNDP and the American National Council for

Public-Private Partnerships. It contains examples of PPP, realisation guidelines and links to other sources on the subject.
Investment Support (2009), *Partnerstwo publiczno-prywatne krok po kroku*, Warsaw: Investment Support.
The 19 December 2008 Act on Public-Private Partnership (*Journal of Laws of the Republic of Poland*, 2009, no. 19, item 100).

Questions

1. Which features of a public service may make it unfit for a PPP scheme and why?
2. List and discuss the potential advantages and disadvantages of realising public services in the form of a PPP.
3. Analyse the different services carried out by Polish local governments. Which of them could be carried out as PPP projects?
4. What forms of cooperation between private companies and local governments are envisaged by the Polish legislation?
5. What are the phases in the preparation of a PPP?
6. How is risk shared in PPP projects?
7. What elements in a PPP preparation may be decisive factors for private company's interest in the project and subsequent engagement of investors?
8. How do you assess the chances of PPP development in Poland? Which sectors do you find the most promising?

Case study 13.C1.
Termy Warmińskie: an example of a partnership creation

Poland is in the initial phase of public-private partnership development and Polish examples of PPP include the international Warsaw airport, highways built as concession projects or the Gdańsk water and sewage network. Nevertheless, until now there has been no partnership created according to the rules laid down in the legislation on PPP both in 2005[3] and the newest in 2008. The following example was one of the first projects where a private partner selection procedure described in the 2008 Act was used. The project has not yet been completed but we can still thoroughly analyse how a public body is preparing itself for the partnership, and go through most of the steps described in section 13.3.

Termy Warmińskie is a complex of hot water brine pools with health spa facilities, hotels, restaurants, sports and leisure infrastructure. The public body responsible for the investment is Lidzbark District. The Lidzbark District is located in Warmia and Mazury Province. It is composed of Lidzbark Warmiński (an urban community), Lidzbark Warmiński (a rural community), Kiwity and Lubomino (the other rural communities) and Orneta (a both rural and urban community). The Warmia and Mazury Province is one of the least developed of the Polish regions. High unemployment, transport problems and low rates of entrepreneurship are the most pressing issues for the province that the district government has to deal with. On the other hand, they are areas with extremely interesting natural life and landscape. In the Province's 2005 strategy document for socio-economic development, it is stated that 'the main objective for Warmia and Mazury Province is to keep its position in Poland as the region with the cleanest environment'. At the same time, the strategy calls for the creation of 'a new way of thinking and a development model that will treat the natural environment as a competitive advantage, a factor that does not limit, but rather integrates economic activity', with sustainable tourism as one tool for attaining this goal. Both province as well as the district authorities point to tourism that is 'respectful of the environment' as the driving force for the region's development.

Another element that constitutes such a vision for the region's development is the first ecoenergy strategy in Poland, created in 2002 by the Lidzbark District. The strategy outlined 'the course of action necessary to increase the use of renewable energy sources in energy portfolio of the district'.

It is worth noting that all of the strategies mentioned above were created with the active cooperation of local community authorities. Whilst on one hand, this might seem obvious because cooperation is a part of the procedures for province and district strategy creation, but in the Lidzbark District case, cooperation between local authorities has been especially successful. This has been proved by the fact that the cooperation was mentioned as the district's strength in the SWOT analyses carried out for the purposes of developing these strategies. Cooperation was also an important element to the creation of the PPP project we describe here.

Step 1

The work on the ecoenergy strategy was a source of inspiration for the initial idea used at Termy Warmińskie where during its creation, sources of geothermal water were

[3] At that time formal misgivings of the Act were to blame. An appropriate form for announcement preparation in private partner selection procedure was not issued.

discovered (Schneider, 2007). And it is here that the first step of the scheme to build a successful partnership begins.

In 2006, district authorities went on study visits to Slovakia and Austria to see the use of geothermal sources in thermal spas. A thorough feasibility study for the thermal centre that analysed the economic, political and environmental factors was commissioned. The study revealed that a thermal spa and a hotel could be built in Lidzbark District. The following assumptions were considered essential for the success of the project.

- The thermal centre must have adequate capacity to win a good market share and stand out from numerous hotels with health spa facilities. Planned thermal spa capacity in the first phase of its construction should attain 600 thermal pool guests and 180 hotel guests. In the second phase of the project, either on the premises of the centre or in its vicinity, further hotels and apartments should be constructed, so as to ensure a share of over 50% of hotel guests of all spa users.
- The thermal centre cannot be aimed at just one target group and marketing should be strongly concentrated on the requirements of customers coming from outside of the region, with a particular focus on guests from Russia. Thus, especially in the initial phase of the project, marketing should be well financed. Furthermore, the management of the thermal centre cannot only administer the centre but must bring the spa actively to market. Because signs of saturation can already be seen in the Central European market for thermal spas, consequently, older, less attractive centres with an unstable market position and without a considerable urban customer base will need to fight for survival.
- Therefore, the thermal centres can only become profitable when they receive massive investment. It also needs to be remembered that the centre is situated in an area with high unemployment and emigration rates.

According to the assumptions of the thermal centre project, the benefits for the region can be achieved only via professional promotion and external financial support (the estimated cost of the investment equals 35 million euro). This is why a public-private partnership was an organisational solution put forward by the study. Furthermore, the study indicated that European Union funds could and should be used to realise the project.

On 20th of July 2006 the project was included in the list of Warmia and Mazury Province's key investments that would be funded with EU money. Preceding this was a letter of intent signed by the representatives of district, provincial and community authorities from the area where the investment was to be directed according to the initial proposals.

Step 2

The second step in the preparation of any successful partnership consists of talks with prospective investors, and analysis of their ideas. The Lidzbark District authorities conducted an analysis of Polish and foreign solutions for the thermal spa organisation whereby they gathered information on potential investors. Initial negotiations with a few companies (from Poland and overseas) demonstrated considerable interest from potential partners in the project. These consultations were a starting point for the initial costing and risk sharing proposals undertaken in step 3.

Step 3

The 2008 feasibility study formed the basis for a final decision regarding the location of the investment in the town of Lidzbark Warmiński. Additional financial and economic

analyses were conducted and once again, showed that the investment was rational and confirmed the necessity of external funding. Although the financial net value of the investment was negative, the ENPV was positive. This resulted from the social benefits appraised in the economic analysis as follows:

- increased inflow of tourists into the region;
- increased availability of leisure services for the inhabitants of the area concerned;
- improved physical and psychological condition for the centre's users;
- savings on transportation to other similar facilities for the inhabitants of the area concerned;
- increased number of jobs in the area;
- reduction in social welfare payments linked to job creation; and
- increased income from VAT.

Initial ideas for collaboration with private companies were also outlined. EU funds were anticipated to cover half of the investment cost (17.5 million euro), with the reminder planned to be raised through the issue of bonds. However, district authorities had little experience with the realisation of similar investments therefore they wanted to find a private partner who would be responsible for management, exploitation and maintenance of the project, as well as for design and construction work. It was assumed that at the end of the project, the private company would become a shareholder of Termy Warmińskie.

In 2008, the project for Termy Warmińskie was submitted to an annual PPP best practice competition (Dobre Praktyki PPP), organised by the consulting company Investment Support,. The project won one of the main prizes, one for financial support for further project analyses. The prize made it possible to create a functional-utility programme for investment. Additionally, as the legislative works for the new PPP act were in progress, new legal solutions were also being considered.

Step 4

The final choice for the form of investment was made on the basis of the analysis but was different from the one chosen in step 3, which resulted mainly from the alterations in the legislation. The idea of issuing bonds was also abandoned, as analysis proved this to be ineffective. According to the revised proposals, the project is supposed to be realised according to the procedures laid down in the legislation on PPP. Whilst risk was to be allocated according to the following general guidelines.

- A private company would be responsible for the construction of the thermal spa buildings in line with the district authorities guidelines (specified in the announcement for the open competition) built no later than the end of 2012. The project must operate in the market for at least 5 years.
- A private partner would have exclusive right to manage the thermal spa.
- A private partner would take over rights and responsibilities stipulated in a preliminary contract, guaranteeing project financing within the EU-funded Regional Operational Programme for Warmia and Mazury from 2007 to 2013.
- District authorities will lease grounds where the thermal spa facilities will be built (on a long-term lease).

Step 5

The formal selection of a private partner, in accordance with procedures detailed in the 19th of December 2008 Act on PPP and the tender procedure from the 9th of January

2009 Act on Concessions for Construction Works or Services, and consisted of the following steps.

1. Announcement of the start of selection procedure.
2. Submission of applications.
3. Formal assessment of applications.
4. Negotiations with those candidates who made their applications correctly. The aim of negotiations was to specify the details of the contract's conditions, especially its financial, legal and technical aspects.
5. Submission of offers prepared by the candidates on the basis of conditions specified by the district authorities in preceding talks (indicated in point 4 above).
6. Assessment of offers.
7. Conclusion of an agreement.

The procedure started in May 2009 and that September after formal assessment of the applications, two consortia were invited for further negotiations.

The tender announcement included the following selection criteria.

- The tenderer's willingness to take over as many services, responsibilities. and risks connected with the PPP project as possible.
- The type and value of remuneration expected by the tenderer from the public body.
- Income sharing between the private and the public partners.
- Ratio of public body's contribution to partner's contribution.
  Functionality, quality, technical parameters, level of technology offered, and cost of the project's maintenance.
- The opinions and propositions concerning functional-utility plan and founding ideas and the private partner's ideas for technical and technological solutions that are innovative, environmentally friendly and ensure reliable functioning of the object and a wide range of applications of thermal waters.
  The number of hours of sports swimming pool usage reserved for children and youth from Lidzbark District and reduced prices for swimming pool and spa usage for Lidzbark District inhabitants.
- The availability of conference rooms free of charge or at reduced prices for training, conferences and celebrations organised by Lidzbark District authorities or the Office of the Marshal of the Province (for example permanent discounts or annual quantity of hours for their use).

Finally, with regards to the planned PPP project of Termy Warmińskie, it needs to be emphasised that all the information was transparent and easily available, and this was ensured through all steps of the process by the local and regional authorities. All information and analysis was available on the Province's website. Although the idea of the thermal spa does have its opponents and there was heated discussion regarding the location and even the idea of a thermal spa, the PPP method itself was not questioned.

Conclusions

PPP might become a public service realisation method that is more beneficial to public interest than traditional approaches. Nonetheless, international experience shows that the PPP method is neither cheap nor easy. Hence, not all of projects fit well with the PPP scheme. Still, the example of Termy Warmińskie complied with basic criteria for a PPP project:

- there are private companies experienced in similar projects carried out both in Poland and abroad;

– risk and responsibility for the project can be transparently shared between the partners;
– measurements that should make it possible to appraise the effects of cooperation were developed;
– the project has got its commercial element – we can identify a cash flow, connected with the effects of the project, that may attract a private company.

Nevertheless, whether the project fulfils the expectations concerning its social benefits (such as job creation or town and community development) will largely depend on the commercial success of the project. The possibility of basing the district's development on the thermal spa is especially important. As seen in studies on the thermal spa, 'the region must promote it and the spa must promote the region'.

The above case study showed that PPP preparation is a multifaceted process that can take many months or even years. However, following all of the steps described in this chapter can be used to help create a successful partnership.

Questions

1. How do you asses whether and to what extent the organisers of the PPP project for Termy Warmińskie complied with the scheme presented in section 13.3?
2. Using the example of Termy Warmińskie, identify the limitations connected with public or private realisation of a project that can be overcome using the PPP approach.

part

IV.

Consumers and citizens

Introduction to part IV

As one of the heroes in 'The plague' by Albert Camus said, 'perhaps we cannot prevent this world from being a world in which children are tortured. But we can reduce the number of tortured children.' These words are the essence of the poet's thinking that led to the award of the Nobel Prize for highlighting 'the problems of the human conscience in our times'.

Revolting against the absurd and injustice can cover many issues, both great and small. We can substitute not torturing children in the above quote with care for public spaces, urban greenery, improving the situation of workers who manufacture goods that we use, protecting valuable natural areas along with many other issues related to sustainable development. In any case, we can contribute to improving the situation because we can simultaneously have both moral and economic motives, related to ensuring that ourselves and others live in a better place

In this part of the book, we emphasise the responsibility that each of us has as individual people, for our surroundings. We influence the world around us by purchasing products and services, contacting our neighbours and other people, and participating in social consultations, etc. We decide what to buy and thus which company we shall support. As consumers we also make many other important decisions, including the most important one, 'whether or not to buy' (chapter 14). We decide whether or not to pick up a rubbish from a pavement or a path in the forest, whether or not to help a neighbour, and whether or not to get involved in collective activities for the common good, cooperating with others or even initiating them ourselves (chapter 15). Even though it may sound idealistic, sustainable development lies in our own hands.

Problems do not solve themselves on their own, so neither can we expect that those problems that affect us to a small degree only, or seemingly do not affect us at all, will always be solved by somebody else. If we do not want children to be tortured, or nature or other common good to be destroyed, we should react when these problems occur. Otherwise, we risk incurring the external costs caused by those who cause destruction or moral damage (see section 1.3). As individual people, we eventually pay for the renovation of public property destroyed by vandals; we suffer from diseases related to environmental pollution; and we share the guilt for irresponsible practices that the companies that provide us with our products commit in poorer countries. If we do not react, others are likely not to react either, and the external costs are likely to amplify.

In the previous parts, we saw many opportunities for individual people to become involved in building sustainable communities, companies, cities, regions, nations, and a sustainable world. Most importantly, they highlighted the need for social participation as follows:

- co-deciding on local development with local authorities and companies active where we live (tool 1.T3; case study 1.C3; chapters 9, 10, 12); and
- influencing corporate behaviour (chapters 4 and 7) and co-deciding their development and activity.

In this part, we take a look at further opportunities for individual and collective actions that anybody can become involved in. We have the right to obtain information from companies and local authorities (although we should treat this information with caution; see tool 14.T1). And we can expect them to introduce certain changes that we demand, based on the information we receive. Furthermore, we multiply our impacts by

cooperating with others, based on our formal and informal connections. A group of people possessing different experience and knowledge, joined by a common goal can have a significant impact on their surroundings (see case study 15.C1). However, it is also worth acting even on one's own because if everybody who is now afraid that his or her small actions could not change much were to act, their common power would be enough to change the world (section 14.2). Many leaders began by gathering small groups around them and leading others by their own example (see case study 15.C2).

Our impacts are not restricted to our direct surroundings because the key here is to perceive a broader context of our actions and behaviours, following the systems perspective presented in chapter 2. As consumers, we buy products that originate from across the world. Having freedom of choice, we can select those that have been produced in ways that we judge acceptable from an ethical or environmental point of view (chapter 7; case study 14.C2). We cannot solve the social or environmental problems by importing products, the manufacturing of which is detrimental to society or the environment in other countries. Many environmental problems are of a global character (climate change for example), as a result of which the external effects related to foreign production to satisfy our needs will sooner or later return to us. Analogously, social problems related to production abroad cause moral damage to ourselves and bring about the risk of increasing social tensions in the world, which sew the seeds of future conflicts.

Thus, we have to be aware of our co-responsibility for our surroundings, sustainable development and the problems about which we hear from the media. At the level of individual declarations, awareness in Poland in this area is increasing. For example, in 1992, 25% of Poles were aware of their responsibility for the state of the environment, and in 2008, 51% had become aware of this. Also, 42% of Poles claimed to be aware of the significance of the individual actions of 'ordinary people' for improving the state of the environment (Bołtromiuk and Burger, 2008, pp. 9–10). As we shall see in the following chapters, only to a limited extent are these declarations reflected in the ordinary people's real behaviour. In their purchasing decisions, most often they pay attention to price, and to a very limited extent do they trust others, and this reduces their inclination to undertake collective actions towards sustainable development. However, we shall also see many examples of activities that each of us can undertake, and which have already been undertaken by others. As our motto for these actions we can use the words of Robert F. Kennedy that he spoke on the Day of Affirmation Address at University of Capetown, on 6th of June 1966, by referring to the most significant danger that prevents changing the existing order of things.

> First is the danger of futility; the belief there is nothing one man or one woman can do against the enormous array of the world's ills – against misery, against ignorance, or injustice and violence. (…) Few will have the greatness to bend history; but each of us can work to change a small portion of the events, and in the total of all these acts will be written the history of this generation. (…) It is from numberless diverse acts of courage such as these that the belief that human history is thus shaped. Each time a man stands up for an ideal, or acts to improve the lot of others, or strikes out against injustice, he sends forth a tiny ripple of hope, and crossing each other from a million different centers of energy and daring those ripples build a current which can sweep down the mightiest walls of oppression and resistance.

Chapter 14.

Sustainable consumption

14.1. Introduction

For several years there had been a shop in Lodz with products from the different regions of Poland and Lithuania, which were often produced by traditional methods. One day it was replaced with a furniture store, and when asked why the old shop with its traditional products had closed down, the owner answered with the question: 'why didn't you shop here?'.

Thus as consumers, through our purchasing decisions we shape the commercial landscape that surrounds us. Our decisions on what and where we buy has a strong on influence producers and retailers. This is because these decisions have a direct impact on the amount of resources taken from the environment as well as the amount of waste that is returned to it.

The cumulative decisions of many consumers, alongside all the decisions made by a single person during their lifetime, are a source of measurable environmental and social impacts despite the fact that each single purchasing decision may potentially be dismissed as insignificant. This process is frequently referred to as the tyranny of small decisions (see section 14.2). As consumers, under the influence of marketing, we often make our decisions based on subconscious preferences and emotions although this does not necessarily mean that we are inherently irresponsible (see section 14.3). However, from the perspective of sustainable development only with the appropriate knowledge and the correct legislative and economic incentives in place can we act reasonably (see section 14.4).

In this chapter, we analyse the awareness and behaviour of consumers. Also as a means of influencing consumer decisions we examine the role of non-governmental organisations (NGOs) (see case study 14.C1) and economic incentives and regulation (briefly referred to in section 14.5; for a more detailed overview, see Fiedor et al., 2002; Kronenberg, 2007a,b). Furthermore, case study 14.C2 examines the impact of grassroots movements building sustainable livelihoods in impoverished countries by influencing consumer purchasing decisions for fair trade.

14.2. The tyranny of small decisions

Buying a newspaper every day costing only 2 zlotys, equates to an annual cost of circa 600 zlotys, and over a period of 20 years this sum grows to 12,000 zlotys.[1] If the same newspaper is purchased by 300,000 people daily, their annual expenditure amounts to 190 million zlotys. Despite the fact that the single purchase of a newspaper is unimportant at the scale of a domestic budget, the cumulative annual revenue from the sale of the newspaper on a national level translates to a significant revenue stream for the publisher. Every decision however small has a large implication when seen on a larger scale, hence the phrase the tyranny of small decisions (see Janikowski, 1999, pp. 31–35).

Newspapers require large amounts of paper, ink and other raw materials during their production process. If one uses the ecological rucksack indicator (see section 5.2) one can see that an average newspaper requires about 10 kg of raw materials to produce it (Mündl et al., 1999, pp. 35–36). The daily purchase of one newspaper by one person

[1] For simplicity, we are assuming both inflation and the discount rate is zero and that subscription does not entail a discount.

results in an annual extraction of 3 tonnes of raw material, and the annual print run of 300,000 newspapers requires nearly 1 million tonnes of raw material.

All other decisions made by consumers accumulate in a similar way, including the decisions aiming to reduce negative social and environmental impacts. As an alternative to printed newspapers, consumers could choose their electronic versions because the full life-cycle impact of electronic publications, especially those available through the internet, is lower than that of printed publications (Reichart and Hischier, 2001, 2002; Hischier and Reichart, 2003; Moberg et al., 2007).

The most significant impact that a printed newspaper has on the environment is from the use of paper. Therefore, sharing a newspaper among a number of readers reduces the relative environmental footprint of that copy (see case study 8.C1). The main impact from electronic media arises from the use of electricity, thus switching to more energy efficient computers (for example using LED monitors or laptops) and routers, and switching to a renewable energy supplier, can further reduce our environmental impact. The environmental impact of an internet newspaper can be reduced even further if our computer is also used for tasks other than reading (for example it is also used for work) with the articles are chosen carefully, and reducing reading time. The newest types of monitors, the so-called 'electronic papers' or 'e-papers', can help to further reduce our environmental impact related to acquiring the news.

The environmental advantages that electronic media has over conventional printed media can be easily reduced by printing. The increased popularity of printing off electronic documents is a classic example of a rebound effect (see sections 3.7 and 5.2). The expected outcome of replacing paper documents with their electronic versions was that the environmental impact would be substantially reduced via reductions in paper use and disposal, however the opposite has happened. The extensive use of electronic documents, the ease of their distribution, the widespread use of computers and printing of documents has caused an overall increase in the number of pages printed and subsequently a greater impact on the environment.

The rebound effect can be seen when innovative and more efficient products become cheaper and begin to be used by a wider group of people (for example personal computers). Products with a relatively lower environmental impact tend to be used more frequently and less efficiently than the products they have replaced. For example, this is a popular issue with energy efficient light bulbs being used to light areas which previously were not lit at all.

Choices relating to the most important environmental impacts include:

- what we eat (arising from its processing, amount of preservatives and additives, and distances over which food is transported);
- how we move around, i.e. our means of transport (see chapter 11); and
- how we build and use our homes: the building materials (see chapter 6) and home appliances we use (through their use of energy and resources).

The groups of products mentioned above: food, transport and products required to build and manage our homes are responsible for 70% of the environmental impact arising from private consumption in the EU as analysed on the basis of its life-cycle (Tukker and Jansen, 2006). These three groups were also responsible for 55% of the expenses of the average consumer in the EU-25 countries in 2006. Within these groups, the following categories of products have the highest environmental impact:

- food produce: meat and dairy products;
- means of transport: private cars and flights; and

– building materials, heating, energy-using appliances.

Thus, the tyranny of small decisions applies to all decisions regarding consumption, primarily:

– the decision of whether or not to buy a given product;
– which product to buy;
– where to buy;
– how we use the product; and
– how we dispose of the product.

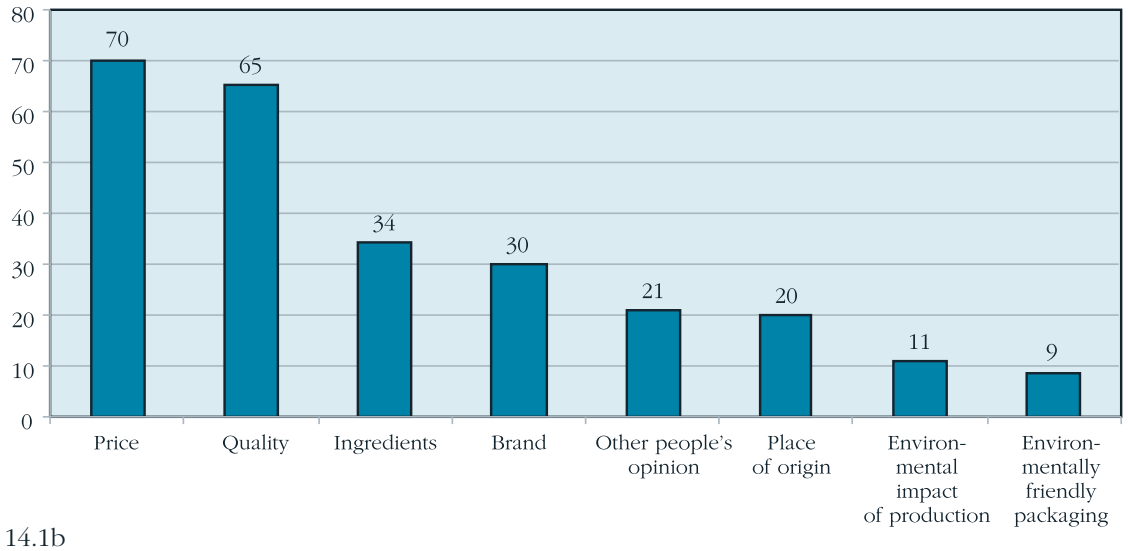
The decisions we make influence the scale of our impact on the environment, both in terms of the aggregated impact of all consumers but also the cumulative impact we as individuals make during our lifetime.

The above decisions are rarely consciously thought about by the average Polish consumer, as our decisions are mainly driven by the price of the products we choose to purchase. The most common decisions we make consciously are 'which product to buy'. Figure 14.1 shows the main drivers behind the purchasing decisions of food products and household appliances. In both cases, no more than 20% of Poles consider the environmental impact of their choices, while 70% see price as their main deciding motive. Decisions of 'how the product will be used' and 'how it will be disposed of' are seen in terms of the cost to consumers (see figure 14.1b). More than 90% of Poles declare that they try to reduce the amount of energy and water they use (56% and 55% respectively do this often, 30% and 28% do so rarely), and 70% say that they segregate their waste (46% often, and 25% rarely). Few consumers consider 'where to buy', which is one of the reasons why the shop owner mentioned above had to close his shop with its regional produce. The most fundamental question 'whether or not to buy' is probably the most seldom asked by consumers (we shall return to this decision in section 14.4). The exceptions are single use disposable products which 39% of Poles say that they try to avoid often while 24% occasionally try to avoid buying them (Bołtromiuk and Burger, 2008, pp. 12–14).[2]

Finally, 'small decisions' can refer to activities that are a lot less costly than the previously mentioned purchase of a newspaper. As we have seen in case study 5.C1 that analysed the life-cycle impact of a refrigerator, some products have more significant environmental impacts than others during their usage phase. This in turn enables the consumers to make decisions on 'how to use their products'. Energy used by appliances left in stand-by mode is a perfect example of how consumers can reduce their environmental impact in the usage phase of a product's life-cycle. Typically, a product on stand-by will drain between 0.5 W and 35 W of electricity. The average Polish household has 4 appliances with stand-by mode, which means that their cumulative energy consumption on stand-by is around 20 W. This is equal to an annual consumption of 2.34 TWh on the scale of the whole country (which would require a 400 MW power station running all year to produce) at the cost of 830 million zlotys (table 14.1). Reducing the use of stand-by would result in an annual saving of 22 zlotys per household. The combined savings from these small decisions would result in 300 million zlotys of savings nation-wide as well as reducing CO_2 emissions by over 1 million tonnes (Wojtulewicz and Osicki, 2006, p. 16).

[2] The cited survey figures for Poland are very similar to the average figures for the EU-27. It is important to keep in mind that sometimes respondents do not declare their motives and actions accurately. The Eurobarometer study (2008, pp. 27–28) showed that despite 75% of respondents declaring a strong will to buy environmentally friendly products even if they were more expensive than their non-environmentally friendly alternatives, only 17% of respondents actually made such a decision within the month prior to the questionnaire response. Similarly, 77% of Poles made such a declaration with only 13% actually acting upon it.

14.1a



14.1b

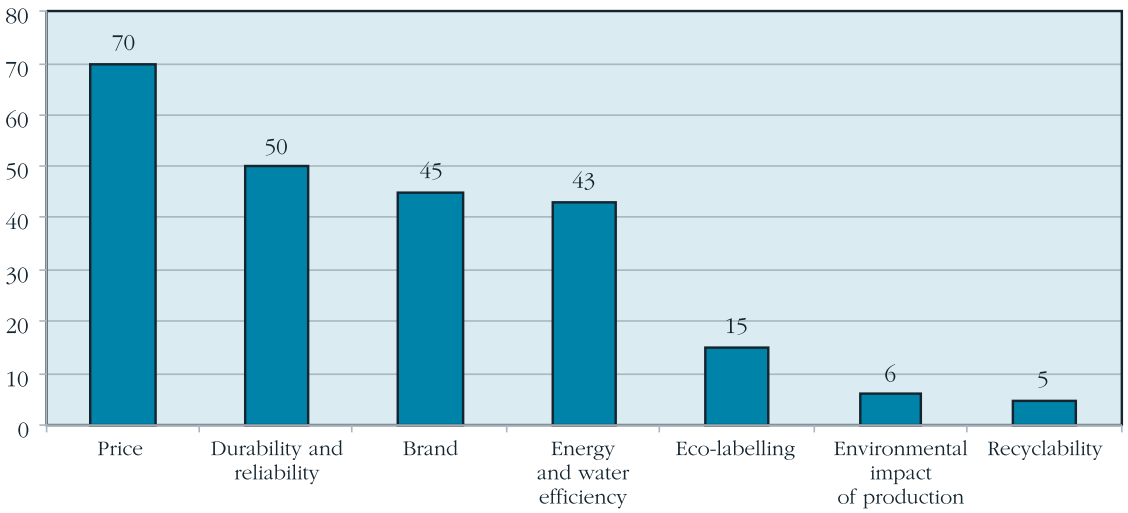


Figure 14.1. Purchasing motives of Polish consumers regarding food products (14.1a) and household appliances (14.1b) – respondents could choose 3 different answers (Bołtromiuk and Burger, 2008, p. 14)

Table 14.1. Electricity use caused by appliances in stand-by mode and the related costs for the average Polish household and for the country as a whole (Wojtulewicz and Osicki, 2006, p. 16)

	Average power consumption	**Average daily power consumption**	**Total annual power consumption**	**Total annual cost**
Household	W	KWh	KWh	PLN
	20	0.48	175	62.4
Nation-wide	MW	GWh	TWh	milion PLN
	267	6.41	2.34	831.8

Consumers, through their seemingly insignificant decisions, impact the world around them. Their impact can be positive in a way we often associate with responsible choices.

14.3. Responsibility

In the second part of this book, we drew upon the relationship between sustainable development and corporate social responsibility. The consumers' role in sustainable development is the responsible choices they make. This impact that consumers have on the environment is often referred to as 'voting with their wallets'; if their decisions are made responsibly such consumption can regarded as 'engaged'.

Responsible behaviour usually requires the consumer to avoid purchasing certain products and services ('whether or not to buy') or choosing products and services that have specific qualities ('what to buy'). The first case usually involves boycotting products of a given company (for example one accused of environmental or social abuses), a specific group of products (for example fur) or products made using a specific production method (for example cruel practices against animals, such as the now illegal in Poland duck fattening).

In the second case, consumers choose between products, some of which contributes to solving a specific environmental or social issue, while others do not. For example, fair trade products which aim to help producers in developing countries obtain better trading conditions and promote sustainability (see case study 14.C2) or, similarly, products manufactured in companies employing disabled people (for example co-operatives for the blind). An analogous example of buying products for a cause is the Snow Leopard Enterprises project, which is run by an international organisation aiming to save the snow leopard threatened with extinction. Through this project societies living in the mountainous regions of Central Asia where the snow leopard lives are able to sell their handcrafts in zoos in the United States under the condition that they abandon poaching. All products are supplied with a label which explains that the purchase is directly helping producers in developing countries and indirectly helping to save an endangered species. Similar techniques can be used to overcome the challenges of sustainable development in Poland.

The responsible choices by consumers mentioned above are usually made via the influence of emotions. These choices are frequently impulsive and limited to choosing products with a relatively lower environmental and social impact or those connected with a specific cause. This impulse can be driven by information bulletins published by governmental departments or by emotionally charged campaigns run by NGOs (see case study 14.C1). Alongside the emergence of the more recent environmental movement in the 1980s and 1990s, many guides have been published for 'green' consumers. The number of ideas included in these books rose rapidly (see figure 14.2) and further fuelled the emotional charge of the informational campaigns and the environmental movement as a whole.

The method of adding an emotional charge relating to helping others and the environment has often been used by companies who label their products as having strong environmental credentials when in reality they had none or were limited. This is referred to as greenwashing and occasionally bluewashing, which is the practice of deceptively twisting facts and actions in order to be seen as more environmentally and socially responsible than the given company or individual is in reality. Greenwash is inherently risky as NGOs and competitors are keen to discredit any unjust claims

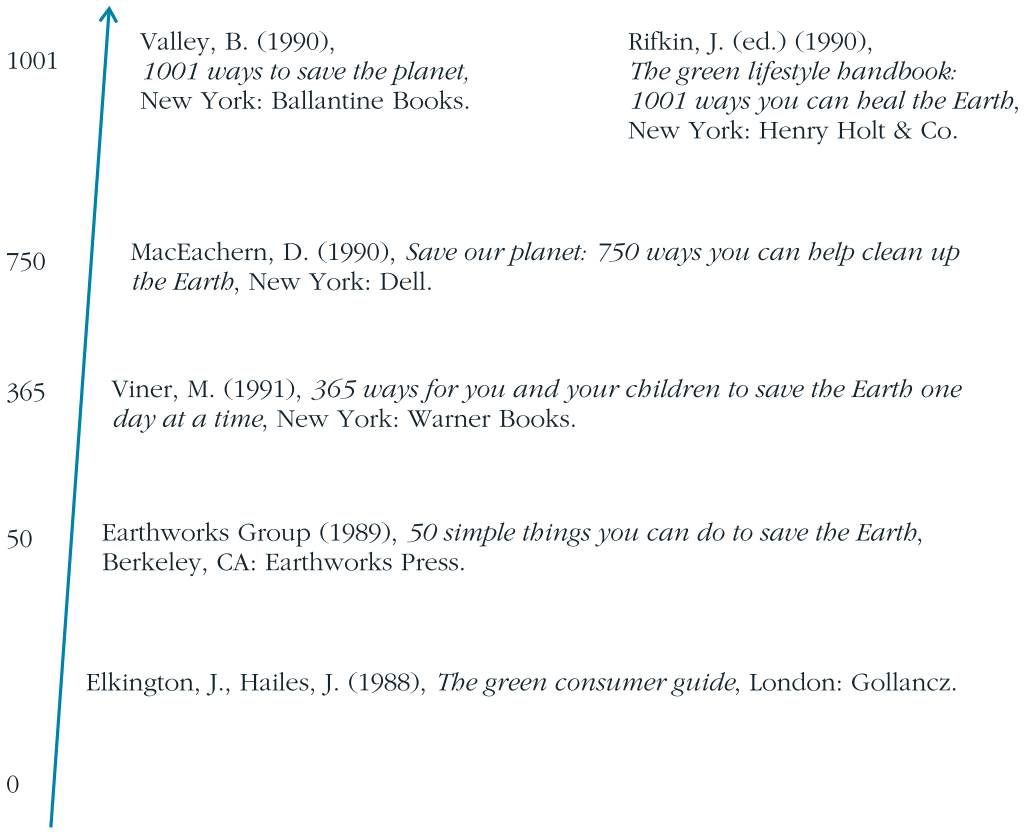


Figure 14.2. The increase of the number of ways 'green' consumers can act more responsibly presented at the turn of the 1980s and 1990s

made by companies, resulting in the company using greenwash being exposed to bad publicity and in some cases encouraging consumers to boycott its products. To distinguish between genuine green credentials and greenwash, a consumer sometimes only needs to look at the terminology used by companies; very often the claims made by companies are so obviously exaggerated that a consumer does not need specialist knowledge or skills to be able to discredit the false claims (tool 14.T1).

Responsible consumption driven by emotions can prove to be insufficient for a full transformation of our societies. Consumers that act responsibly in some areas, who do so solely on their emotional responses, might act thoughtlessly in others because they may not possess the appropriate knowledge or motives to make a responsible choice. For example, a person who is against cruelty to animals may, on a day-to-day basis not otherwise consider reducing his or her environmental or social impact. Therefore, sustainable consumption requires consideration by searching for information and the appropriate basis for motivation.

Tool 14.T1.
Evaluation of corporate messages

'By buying this notepad you are saving Polish forests', despite the fact that this kind of message on a label attached to a 3-pack of notepads seems convincing, it also raises certain doubts. In what way are we saving Polish forests exactly? Could it be that this 'saving' is being done at the expense of forests abroad? In this specific example, the notepads were made in China, therefore in light of our discussion regarding environmental services (see chapter 1), it is hypocritical and near-sighted to be trying to save 'our' environment at the cost of 'their' environment. However, practices such as this are common among companies trying to take advantage of consumers who want to favour environmentally and socially responsible producers. Greenwash can be either trivial or involve significant marketing campaigns that cost more than the cost of the initiatives they are meant to promote (for example the Ecomagination campaign by General Electric; see Esty and Winston, 2009, pp. 138–139).

Although there are a number of rankings for socially responsible firms, they are sometimes less objective than one would like. Having a critical eye for messages from companies boasting their green credentials allows individual consumers to spot greenwash. A simple analysis based on the following 10 criteria (shown in table 14.2) was first published in a joint report by two companies promoting corporate social responsibility, BSR and Futerra, and can be performed in order to quickly determine whether or not we are dealing with greenwash. If any of the following criteria are met the consumer should look more closely to determine whether or not the message is valid.

In line with the concept of reasonable consumption, which is presented in the following section, sustainable development requires that consumers analyse the information and messages that they come across in the market place. It is essential that people reflect on the validity of the messages they are presented with as well as the basic environmental and social impacts of the given company's actions.

An analysis of the quality of the message is primarily dependent on how we answer the following questions: 'is the message clear?', 'is it specific?' (primarily does this contain specific data and figures), and 'is it convincing?'. Essentially, a consumer needs to decide whether the claim of being 'green', 'environmentally friendly' or 'sustainable' can be substantiated. An example of abusing the above terms are the 'eco-sellers' of Allegro.pl (an internet-based auction house), where a seller can be labelled as an 'eco-seller' merely by donating to the 'ecological foundation' run by the owners of Allegro.pl. Most of the products sold by 'eco-sellers' do not have anything to do with sustainability, and in some cases are in direct opposition with the sustainable development movement as a whole.

Companies aiming to be seen as responsible citizens should focus on the environmental and social impacts of their business. If a company extensively refers to a secondary aspect of their environmental impact, whilst omitting the primary impact, they are most likely trying to divert the public's attention away from it. An example of this can be a bank boasting about its paper recycling scheme. Although this is an important issue, the most significant impact that banks have on the environment is related to how their funds, lent to their clients, are used. If a bank lends to industries which have a very significant environmental and social impact, the issue of recycling its paper becomes relatively insignificant. A similar example was the upgrade of the

Table 14.2. Basic criteria to determine the validity of green marketing (Horiuchi et al., 2009, p. 7)

No.	Criterion	Description
1.	Vague language	Unclear description, with no clear meaning (for example 'environmentally friendly')
2.	'Green' product from a 'dirty' company	Upgrading the lighting system with energy efficient light bulbs in a factory the primary impact of which is water pollution
3.	Suggestive images	Images which unjustifiably suggest a positive impact on the environment (for example flowers growing out of chimneys)
4.	Message unrelated with the main issue	Emphasising the improvement of a relatively insignificant issue, while almost all of the important issues have not been addressed
5.	Best in class	Declaring the company is at least slightly better than its competitors, even if the competition is not aiming to act sustainably at all
6.	Unbelievable claims	Making the product relatively less harmful does not always mean that it stops being harmful, for example organic cigarettes
7.	Technical language	Claims made in a way that only a scientist or industry specialist would be able to understand or verify
8.	Imaginary partners	Labels which look like they are from an independent certification scheme, but in reality are not (see tool 7.T3)
9.	Lack of proof	A phrase which seems doubtful, and although it could be possible, it is not substantiated by evidence
10.	Lies	Fabricated slogans and data

Ford factory in Dearborn. 2 billion dollars were spent to increase the energy efficiency of the buildings, but in which gas guzzling cars were being produced.

After analysing the basic criteria, the consumer can reflect on these more specific questions.

1. Is the company acknowledging the full extent of its relationships with the economy and the surrounding environment? Presenting only a portion of its impacts may be an attempt to distract the consumer from the full implications of the company's activity.
2. Are all the actions of a company coherent with the message it is putting across?
3. Does the company take into account the impacts of its supply chain (see chapter 7)? Is it working with its suppliers and customers on sustainability issues?
4. Have all of the company's stakeholders been involved? We emphasised stakeholder dialogue and social participation throughout this book, see for example case study 1.C3.
5. Have the claims made by the company been externally verified by an independent organisation? For example, does the product have an eco-label from a recognised certification body?
6. Are the highest levels of management involved in the sustainable development practices of the company?

7. How is the company behaving in other countries? It is common for companies to act in a more socially and environmentally responsible manner in developed countries, while not doing the same in developing countries.

Some of the above information may be difficult to obtain for consumers, but they are often published on company websites, corporate social responsibility (CSR) reports, NGO reports, and through direct contact. An interesting example of this last source is the story of Actimel yoghurt, promoted by Danone using commercials in which it stated that 'consumers drinking this yoghurt for two weeks will feel the difference'. The marketing campaign was considerably criticised for this vague statement. Finally, it is worth noting that reliable information, both positive and negative, often comes from external sources, such as NGOs. Occasionally, companies do not advertise themselves as being sustainable and do not take credit for their environmental achievements and this is often the case among small and medium sized companies in Poland.

14.4. Reason

Awareness of the ways we can influence the world around us requires us to reflect on the decisions we make and their impact on society and the environment. Consumer's values (for example regarding child labour) must be in line with the general well-being of our global society if we are to make the shift towards sustainability.

Sustainable development can be supported through 'reasonable consumption' (aware, and driven by reason; Kronenberg, 2007a,b). Changes in consumption models should account for the limits of ecosystems to provide services for the economy and society. Reasonable consumption therefore should take into account the fact that the existence of humanity is contingent on the good health of the ecosystem that supports it, alongside the long-term impacts that our consumption habits have on the environment. In practice, this means making consumers aware of the direct impacts that their consumption has on the degradation of the environment they know of only through the media.

Apart from responsible practices outlined in the previous section, reasonable consumption requires primarily:

- reducing material consumption; and
- shifting to consuming services (or functions) rather than materials.

As outlined in chapters 1 and 3, it is essential that we reduce the scale of the environmental impact that our society has. Reasonable consumption is a form of reducing this impact to the scale of the individual consumer. The most significant questions that he or she should ask are: 'whether or not to buy?', 'what to buy?', 'how to use it?', and 'how to dispose of it?' (see the 3R rule as described in section 12.1). These require evaluating as follows:

- whether or not the consumer really needs the given product;
- what are the alternatives to satisfying this need, for which he or she is purchasing the product; and
- how can the consumer reduce the impact of the product by using it more efficiently and disposing of it properly.

Reasonable consumption addresses real needs. One of the primary ideas for reasonable consumption is 'sufficiency' and the reduction of unnecessary purchases

to a minimum. The most obvious area where this can be achieved is reducing the purchasing of single-use, disposable items, such as packaging, and replacing disposable cutlery, plates, pens, and batteries etc., with reusable products are the easiest solutions of this kind. A reasonable consumer uses only as much energy, water and other resources as he or she actually needs. Similarly, as all the products we buy have an impact on the environment during their production, consumers should consider whether or not a given product is necessary. Often, goods purchased on impulse or on a one-off need are used only once after which they lay unused.[3]

Consumers should be able to choose from various methods to satisfy their needs, by not only limiting themselves to purchasing products. In many cases, the same function can be supplied by products, services, and other options such as sharing. Reducing consumption can be a way of promoting an economy based on functionality (see section 8.2), in which it is not products but services derived from products that are traded. However, for this to be possible, a different level of consideration is required than that of just simply choosing between different products. For example, the need to move from place to place can be satisfied by various means of transport (see chapter 11). Just as it was the case with the shop selling regional produce in Lodz, a consumer who decides to purchase his or her own vehicle claiming that this is due to poor public transport, is in fact contributing to the degradation of public transport (see figure 11.1). By reducing demand for public transport, the consumer follows the tyranny of small decisions leading to the reduction of revenue for public transportation companies. An intermediate option might however be car sharing or car pooling (see tool 11.T2).

Thus, one way of reducing the relative environmental impact of a product is to share it (for example sharing a newspaper). Another would be to repair and improve it, which increases the longevity of products. An alternative to disposable products is a more efficient use of reusable ones. A similar example is of a more energy efficient way of using products (for example regulating the refrigerator to run at lower energy intake levels or not using the stand-by mode). An important way of determining both the environmental impact and the total costs related to products is an analysis of their life cycles (LCC, see case study 5.C1).

At the end of the useful life of a product, it is the consumer who decides how to dispose of it. The most important issue at this point is the proper segregation of waste (see section 12.2). Products which can still be used, but which we no longer want can be sold or given away, which again prolongs their life. The interesting examples of this concept in giving away our unwanted products so that they have a new life include: the Warsaw movement 'Uwolnij łacha' ('Set your clothes free'); book crossing; and exchanging other, miscellaneous items, such as Freecycle or Craigslist. Additionally, unwanted but still usable goods can often be donated to charity. Car boot sales, swap meets or flea markets as well as pawn shops also play an important role in finding new owners for used products. The main elements of the second-hand market in Poland have been described by Janikowski (2004, pp. 168–171). When trying to reduce the demand for new products consumers can often supply their needs via second-hand alternatives.

A similar effect can be achieved by segregating waste which cannot be reused, for example packaging, white goods, batteries and organic waste. A reasonable consumer

[3] A movement worth noting here is voluntary simplicity or simple living (Elgin, 2002), which promotes reflecting on the values one has, as a determining factor for consumption decisions. Supporters of this movement often refer to concepts from the Far East, such as the Japanese *taru wo shiru* – to know when enough is enough.

should segregate waste, to enable as much of the raw materials contained within them to be recycled and reused as well as some of the energy embedded within these products. Both methods for managing waste reduce the amount of raw materials extracted from the environment as well as reducing the social impact of increasing the amount of waste going to landfill. Reducing consumption therefore would become less of an issue if more of the materials used for the production came from within the economic system (i.e. recycling), and energy was sourced from renewable energy producers. Nevertheless, recycling does not always constitute an environmentally preferable option because it may be unattractive economically or even environmentally if the amount of energy required to recycle waste into reusable secondary materials exceeded the amount of energy necessary to acquire resources and transform them into useful materials. Additionally, recycling is burdened by the downgrading of the physical properties of materials (also known as downcycling). This is why the best solution to problems such as these is to avoid them entirely (the prevention approach, see section 1.4).

Reasonable consumption requires consumers to search for information individually regarding the environmental impact of the various ways available for meeting their needs throughout the entire life cycle of the product (see chapter 5). Environmental product declarations and eco-labels based on life cycle assessment (LCA) can help consumers to make their decisions, however interpreting the data found on such labels often requires specialist knowledge. The information often sought by consumers refers to cost savings related to lower energy, water and waste bills and information relating to health impacts is also important. Reasonable consumption is also healthy and complements a healthy lifestyle, for example, choosing less processed food products. Furthermore, reasonable choices encompass the decision of 'where to buy' because a large portion of environmental impact is caused by the transport of products so consumers should choose food which is grown locally and in season.

Responsible and reasonable choices can be based on economic criteria (where the prices represent the full economic, social and environmental costs of production and distribution) or health criteria (when appropriate information is available). Moreover, these choices can be based on a consumer's own internal conviction of socially accepted behavioural patterns with these patterns dependant to a certain degree on the behaviour of other consumers. The less litter is seen on the streets the lower the likelihood that a passer-by will throw something on the ground, thus to change behavioural and consumption patterns, often all that is required is to observe other consumers behaving responsibly and reasonably. That is why it is important to promote responsible behaviour as a lifestyle choice that others can follow. Subsequently, the tyranny of small decisions begins to work towards sustainable development because individual choices aggregate with one another, to make a larger positive change. Social control, i.e. the enforcing of social norms, can also be a means of influencing producers and service providers to make responsible choices. This may apply to many aspects of social life, such as using public transport, reducing water and energy use, caring for public spaces, and volunteering (see chapter 15).

These motivational factors above show what the key areas are for changing our attitude towards consumption as well as the behavioural patterns of other people, and indeed, groups of people can also support each other in changing their attitudes (see tool 14.T2). Whilst reasonable consumption can complement sustainable development, this requires a collaborative approach between individuals, the state, and companies as

well as NGOs. Their goal should be sensitising and informing consumers so that the motives cited above are internalised, while at the same time implementing the economic tools to incentivise further the individual consumer to make responsible choices.

Tool 14.T2.
Eco-teams

The Global Action Plan is an international network with its headquarters located in Sweden, that promotes sustainable development education and sustainable consumption <www.globalactionplan.com>. One of the best known achievements of the organisation is its eco-teams programme, running since 1990. The aim of these teams is to analyse their impact on the environment and try to reduce it together. The programme has been operating in Poland since 1997 <www.gappolska.org> and is predominantly aimed at schoolchildren (in the 2008/2009 school year 18,500 children took part in the programme). In each case, a letter of approval must be signed by the parents who then take an active part in implementing the resulting solutions, together with their children.

This programme is aimed at reducing the use of raw materials, energy, waste and protecting the environment alongside promoting a sustainable lifestyle. The eco-team should work together for 6–7 months, which allows for a change in habits and to observe the results. It is recommended that a record is kept of the measurements of energy and material consumption to help see the effects of the behavioural change at the end of the programme.

The participating teams receive handbooks which include basic suggestions on behaving more sustainably, along with magazines with further suggestions and up-to-date information on other teams' activities. Guides for teachers and instructors wanting to get involved in this programme on a wider scale are also available. The basis for the programme always consists of teamwork so that the participants can motivate and support one another.

In addition to the eco-teams an 'Eco-team reporters' programme was launched to promote the eco-teams' work on a wider scale within the school, the local community and on-line, with this programme mainly aimed at older students.

14.5. Summary and conclusions

Realising that consumers have an impact on their surrounding environment and that every decision matters gives us the option to make our impact either positive or negative. Consumers make many purchasing choices: 'whether or not to buy?', 'what to buy?', 'where to buy?', and 'how to use?' etc., all of which influence demand which in turn is met by producers. Furthermore, they can be active within consumer and citizen movements, which we will examine more closely in the following chapter. A stronger social control system would prevent competing towards the lowest social and environmental standard because analysing the way we spend our money does not have to mean that we do not spend at all, but that we spend wisely.

As we observed in chapter 1, consumer decisions are often based solely on prices which do not include their external costs. Changes to the consumption structure require internalising the external costs as well as shifting away from paying for products and towards paying for the services for which these products provide. Policy decisions

should promote strategies and tools that aim to improve and increase the availability of information regarding the impact of products on the environment along with the least harmful way of using them. In this context, educational programmes implemented by NGOs are very important (see case study 14.C1), but should also be extended to other levels of formal education.

With reference to products which cannot be avoided and cannot be replaced by services, there needs to be a system of managing their reuse and disposal once their phase of use has ended. It can be argued that products that would be returned and recycled after use have performed their intended service, and the raw materials which they are made of can be used for a different purpose.

Instruments that can be used to promote sustainable consumption include (Jackson, 2005, pp. 128–132):

- creating the right conditions for making responsible choices, for example recycling collection points and the relevant information;
- institutional context, including the enforcement of adequate environmental standards;
- social and cultural context – changing social norms, ethical codes and behavioural patterns; and
- examples of good practice promoted within businesses, local communities and the public sector.

Within the last category, an important role is played in transferring the concept of sustainable consumption to popular culture. A good idea would be to incorporate responsible decision making into TV series which have an enormous influence on consumer behaviour. Showing attitudes and examples of reasonable behaviour from this book (such as segregation of waste, cycling instead of driving, working within the local community or taking care of urban green spaces) in the main characters of a TV series would probably have a greater impact on influencing consumer behaviour than any number of academic lectures. For example, in 2000, one day after a character in one of Mexico's most popular TV series enrolled on a reading and writing course because he no longer wanted to be illiterate, a quarter of a million people enrolled on similar courses across their country, and after a few more episodes the number had grown to 840,000 (Brown, 2001, p. 227).

Practical resources

<www.youthxchange.net> a guide to sustainable consumption published by two UN bodies (UNEP and UNESCO).

<www.unep.org/themes/consumption> UNEP's website with materials relevant to sustainable consumption.

<www.ekonsument.pl> website of the 'Kupuj odpowiedzialnie' ('Buy responsibly') campaign run by Polska Zielona Sieć (the Polish Green Network).

<www.fairtrade.org.pl> the website of the Polish Fair Trade Coalition.

<www.greenwashingindex.com> an internet service provided by EnviroMedia Social Marketing and the University of Oregon which promotes approaching green marketing with scepticism.

Horiuchi, R., Schuchard, R., Shea, L., Townsend, S. (2009), *Understanding and preventing greenwash: a business guide*, London: BSR and Futerra.

Questions

1. Give examples of positive and negative effects of the tyranny of small decisions in a social and environmental context.
2. Why is the decision 'whether or not to buy?' the most important one for consumers trying to act sustainably?
3. What kind of economic mechanisms can encourage responsible and reasonable behaviours among consumers?
4. Which area of sustainable consumer education is best developed in your country, and which areas are least developed?
5. In which ways can consumers exert pressure on companies? Give 10 examples.
6. What criteria do you think are most adequate for evaluating corporate actions? Why? And what criteria (other than those mentioned in tool 14.T1) can you suggest?
7. What issues would you note when evaluating messages regarding the sustainable development of a car company, an oil company, a crayon producer, a courier, a grocery store network and a water company? Refer to the information in part II and III of this book.
8. Give an example of a company that you think is acting in accordance with sustainable development. Can this company be regarded as sustainable using the criteria and questions presented in tool 14.T1?

Case study 14.C1.
Consumer education by NGOs in Poland

One of the main barriers to sustainable development is consumers' lack of knowledge regarding the impact that they have on their surroundings and how that impact can be changed (see section 1.4). By adapting educational models created by NGOs abroad and using their own experience, Polish NGOs are trying to improve consumers' awareness of sustainability issues. They disseminate information regarding the environmental impact of products and consumption patterns, but primarily try to promote responsible and reasonable choices. The most active in this area is the Polish Green Network (PGN, Polska Zielona Sieć), which runs the 'Buy responsibly' ('Kupuj odpowiedzialnie') campaign, as well as WWF Poland, which has a number of programmes directed specifically at consumers. Before we move on to describe these examples in more detail, first we examine the NGO education campaigns and similar initiatives more generally.

In the introduction to part II we noted that NGOs have a significant influence on companies' sustainable development practices. This influence is based primarily on informing, educating and sometimes mobilising consumers to use their purchasing power against companies that act irresponsibly. Some NGOs work to confront companies (for example Greenpeace investigates a given company's dealings, and tries to exert direct pressure as well as encourage consumers to boycott the company's products). Other groups do not target individual companies but rather try to influence the habits of consumers in general (for example the Polish Green Network, PGN). An important area of work for many organisations is educating the general public on how society and the environment are interrelated and what this means for the average person. Below, we focus on informational and educational techniques that aim to present consumers with new ideas and encourage them to become more involved.

The below examples (in alphabetical order) illustrate the variety of actions that are aimed at consumer education that are undertaken by NGOs in Poland.

- The Aeris Futuro Foundation CO_2 calculator – a tool which enables consumers to measure CO_2 emissions associated with their lifestyle. Additionally, the organisation's website provides information on how to reduce these emissions <www.aeris.eko.org.pl>.
- The Fair Trade Coalition – promoting the idea of and products from fair trade (case study 14.C2).
- The Gaja Club – the 'Know what you eat!' programme ('Czy wiesz co jesz?') which draws attention to the welfare of farm animals. For example, its 'Keep your eye on the egg!' ('Kupuj jajka z głową') project aims to increase awareness of egg labelling standards <www.klubgaja.pl/zwierzeta/czy_wiesz_co_jesz>.
- GAP Poland – Eco-teams programme (tool 14.T2).
- Greenpeace – the 'Endangered species for sale' project which targets shops trading in endangered marine species and products made from them in Poland <www.greenpeace.org/poland/co-robimy/morza-i-oceany>.
- Polish Humanitarian Action 'Fashionable and ethical' project that draws consumer attention to who, where and in what conditions made their clothes <www.modnieietycznie.pl>.

Within the above programmes, the NGOs created websites, published reports, held press conferences and organised workshops for activists, teachers and anyone else

who wanted to take part. The programmes referred not only to feelings but also informed consumers in promoting responsible as well as reasonable consumption. The largest scale projects of this kind are being run by the PGN and the WWF.

The Polish Green Network (PGN): 'Buy Responsibly'

The PGN is a coalition of national non-governmental organisations (NGOs). Their long history and large scale of operation makes the PGN a significant example of how sustainable consumption can be promoted, which in this case has been combined with educating the public on consumer rights.

The main product around which this campaign focuses is the *Good shopping* guide (published several times since 2003). Despite the book's outlining of important issues whereby consumers consider, and compare products based on sustainability criteria, it has not been very practical for the Polish consumer. The reason is that it was based on the British *Good shopping guide*, published by ECRA in 2002, and often referred to products that are not present on the Polish market or are out-of-date.

In 2007, the PGN published a new guide, *Buy responsibly*, written by Polish authors (Huma and Krzystkiewicz, 2007), aimed at students in secondary schools. Despite being updated, the main research sources were still foreign and sometimes referred to products unavailable in Poland. References to specific situations in the Polish context were still limited, and the value of this guide similar to the previous one was diminished to the general issues raised regarding sustainable consumption. However, one additional advantage of *Buy responsibly* is that it includes materials for educators.

Other guides published by the PGN that refer to sustainable consumption, include the following.

- *How to buy and not get hunted down* (Huma, 2006), which analysed different forms of pressure and manipulation from the perspective of producers and emphasising the role of conscious and reasonable consumer decisions.
- *Green signs, how to choose environmentally friendly products* (Zaniecki, 2003), an overview of eco-labelling initiatives (see tool 7.T3).
- *Consumer rights in the light of environmental protection* (Stoczkiewicz, 2003), an overview of governmental institutions and regulations regarding consumers' rights.

Activity has grown surrounding these publications, including most importantly the <www.ekonsument.pl> website where users can access information about sustainable consumption, use links to other websites covering the subject and access the PGN's publications in electronic form. Within this campaign, 10 Regional Educational and Informational Points have been set up, where interested consumers can find out more on sustainability. In 2006 and 2007 under the national 'What should a young consumer know?' campaign, the PGN published a series of three guides for children of different age groups, outlining their rights and obligations as consumers and carried out 480 workshops.

WWF: 'What fish is for dinner?', 'Let's make a good atmosphere', and 'You decide'

The WWF is the largest NGO in the world, and since the beginning of the transformation period, it has been active in environmental protection in Poland, with a permanent office since 2000. In recent years, WWF Poland has become involved in consumer education and has launched the three campaigns cited above. The WWF has widespread influence, thanks to good workflow management, media contacts, and international experience.

One of the areas in which the WWF is active is protection of the Baltic ecosystem, by working towards more sustainable fishing practices (see case study 1.C2). Within this framework, the WWF is trying to inform consumers that their individual decisions have a significant effect on the protection of the sea and its resources. In 2008, it published two guides for consumers: *What fish is for dinner?* and *Fish dishes: the dark side of seafood*. The first guide gave an overview of different fish species and the level of their endangerment from overfishing with each species allocated a category as follows:

- green (not endangered, and recommended for consumption);
- yellow (information on it is incomplete, or fishing practices are stressful for the environment, therefore avoiding these types of fish is recommended); and
- red (species that are endangered and fishing practices are harmful to the environment; consumption should be avoided; including cod).

The second guide highlighted the harmful impacts of fishing alongside waste in the production of the six most popular fish dishes in Europe (flounder filet, seafood paella, lobster paste, fried cod, swordfish steak, and tuna sushi). The guide examined issues such as overfishing, poaching and damaging fishing methods. In both guides, materials were used that had been also published in other countries. As a result, despite their publication coinciding with the problems described in case study 1.C2, these guides did not provide cod any more attention than other species even though they were of less significance in Polish cuisine.

The campaign that had started in 2006, 'Let's make a good atmosphere', focused on raising awareness of the relationship between consumer choices and climate change. It outlined the impacts of specific consumer decisions and advised on ways to minimise them. The campaign also underlined that every decision counts. A brochure entitled *How to save energy at home* was also published as part of this campaign and included practical advice on which products are most energy efficient and how to use these products to further minimise energy use. The information was laid out in a wider context, comparing the energy usage of various appliances, so that consumers knew where the hot spots were, and where to focus their attention. The calculations included in the brochure showed how much savings can be made when switching to energy efficient appliances. As in other European countries, in Poland the WWF supports the <www.topten.info.pl> portal which offers a ranking of the most energy-efficient products in various categories based on their long-term operating costs.

One of the areas in which the WWF is active is protection of the Baltic ecosystem, by Another example of how the WWF is trying to educate the Polish consumer is through the 'You decide' campaign that encourages people to take part in public consultations (see tool 1.T3 and case study 1.C3). The aim here was to inform individuals of their potential to influence investment decisions and regulation, and thus have an impact on the world they live in. The WWF tries to inform the general public that they have the right to request information regarding the environmental impact of planned investments and they are entitled to answers. Questions and motions that have been raised by citizens must be made public along with information on whether or not they have been acknowledged (with explanations).

To sum up, the examples above show that there is a role for NGOs in helping consumers to make responsible and reasonable decisions. Their activities are made possible by their independence (from both the public and private sector) which in turn gives them credibility. Their activities are usually understood as being for the common good or moving society towards greater public order (see chapter 15). These

organisations help in strengthening social capital through their educational activities. However, thus far with regards to their educational purposes, NGOs in Poland have primarily been using materials developed in other countries. A wider use of materials tailored specifically towards the Polish consumer could increase the impact of their campaigns.

Questions

1. What conditions must be met for NGOs to remain credible while promoting responsible consumption? How would you regard an NGO that promoted a specific company, product or service?
2. What national examples can you give that could form the basis of a guide on sustainable consumption?

Case study 14.C2.
The fair trade sector in Poland[4]

A direct form of engaging consumers in developed countries in improving the economic, social and environmental conditions for people living in developing countries is fair trade. A consumer, who consciously chooses high quality products, helping producers in developing countries, also receives the premium of knowing that he or she is acting responsibly. Until now fair trade was growing primarily in the developed countries of Western Europe, however it is now also rapidly gaining popularity in Poland.

What is fair trade?

Fair trade is defined as a partnership that aims to increase the equity of international trade. In contrast with conventional trade, it offers a better deal for producers and workers in developing countries.

A product can be traded fairly if a producer can guarantee decent working conditions,[5] and respect for the environment and local culture. Each type of product has specific standards in that it has to meet in terms of quality and production methods. Producers that meet these requirements are entitled to the following benefits:

- a fair price which provides producers a profit;
- a portion of payment is made up front;
- long-term contracts, which enable better production planning; and
- a premium for local investments (for example schools).

Fair trade is connected with sustainable development through standards imposed on producers (regarding social and environmental factors) as well as providing them with the resources they need to act on these requirements. Funds come mainly from consumers in developed countries, who are willing to pay a premium for fair trade products. Consumers pay this premium because they perceive the added value of products that guarantee that the producers were treated ethically and with dignity. This added value also stems from knowing that one is contributing towards sustainable development, thus the consumption of fair trade products is both responsible and reasonable.

The process of institutionalising fair trade begun in the late 1980s, were initially, individual countries had separate organisations that were gradually unified into a coherent certification scheme. Since 1997 the main body responsible for setting standards and certifying products is the Fair Trade Labelling Organisations International (FLO). The FLO is the owner of the most popular fair trade label (the eco-label; see tool 7.T3). The fair trade label (figure 7.2) has been used on products which meet the FLO standards, and by the end of 2008 over 6000 products were certified.

Similarly as with other eco-labelling programmes, the FLO has its competitors. Some products labelled as fair trade do not have any certificates or are labelled by distributors or the producers themselves. But despite sharing the same concept, they lack the transparency and quality of the standards used by the FLO. In some cases, standards are developed through smaller organisations associated in the World Fair Trade Organisation (WFTO, previously the International Fair Trade Association). WFTO certificates are given to organisations, and not specific products. However, the organisations above do cooperate with each other to promote fair trade.

---

[4] This is an updated and shortened version of the previous analysis (Kronenberg, 2008).

[5] The aim is primarily to avoid child labour, respect human rights and other standards laid down by the International Labour Organisation (ILO), alongside gender equality and a decent wage.

The popularity of fair trade products has been rising steadily, due among other things to the support they have received from international institutions, including the European Union. Support is not limited to declarations (the European Commission and the European Parliament have declared fair trade as a significant way of aiding developing countries). Financial aid has also been made available to organisations that develop and implement fair trade standards.

The largest market for fair trade products is in Western Europe and North America. In absolute terms, the largest volumes of sales are traditionally recorded in the United Kingdom and the United States, however in relative terms (fair trade as a proportion of total sales) Switzerland[6] and the Netherlands take the lead. In 2008, as in previous years and despite the global economic downturn, the sale of fair trade products had risen in the nine largest markets by over 40%.

Fair trade in Poland

Experiences in Western Europe have shown that the popularity of fair trade products are closely correlated with understanding of how fair trade works. Thus, a key aspect of promoting fair trade in Poland is informing consumers on both the structure of fair trade and the impacts that it has on communities in developing countries. Despite there being a sharp rise in the amount of information and events relating to fair trade in Poland, certified products are still rare, with knowledge of fair trade among Polish consumers' and sellers' still relatively limited.

In 2003, a company called the Taste of Freedom was created, selling coffee from Chiapas in Mexico, and despite not being fair trade certified, the way their product was produced and distributed was similar to that of certified products. However, after more than a year the company closed down.

Subsequently, in order to increase awareness of fair trade, the Polish Fair Trade Association was established in February 2004. The association primarily dealt with informing and educating the general public and in 2006, it started also to sell fair trade products and became the main supplier of these products in the Polish market (see figure 14.3).[7] Thanks to the efforts of the Association and based on a mutual agreement with the FLO, the fair trade logo was registered in Poland. The Association runs an internet shop offering around 250 products that it also distributes across a network of stores throughout Poland. Unfortunately, the Association is too small to import goods directly to Poland and must buy its fair trade products from Germany, resulting in higher retail prices.

The creation of the Fair Trade Coalition in 2009 had been a step towards creating a national certification body which would work in partnership with the FLO and import products directly into Poland. It was launched by 11 NGOs, including: the eFTe, the Polish Humanitarian Action, the PGN and the Polish Fair Trade Association. In May 2009, members of the coalition jointly organised a celebration of International Fair Trade Day (organised in Poland for a fourth time). Educational activities are also jointly run and aim to increase awareness regarding current situations in developing countries and with fair trade.

A small number of products are imported by independent distributors, and these products are certified as organic agriculture and can usually be found in stores selling

[6] For example, more than half of all bananas sold in Switzerland are fair trade certified.
[7] For comparison, the global sales of fair trade products in 2008 were: coffee – 65,808 tonnes; tea – 11,467 tonnes; rice – 4685 tonnes; sugar – 56,990 tonnes (FLO, 2009, p. 23).

organic food where there are no national substitutes (for example cocoa and its derivatives or coffee). This has been possible because fair trade products are often certified as being produced using the methods of organic agriculture. This is because requirements that have to be met to receive a fair trade certificate are nearly identical to those that are required for organic farming certification.

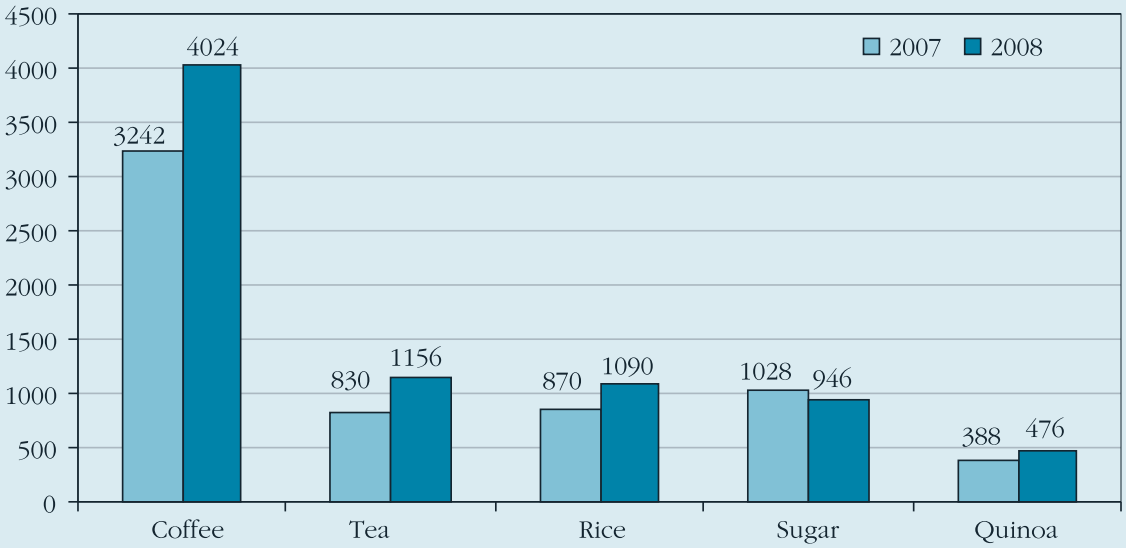


Figure 14.3. Sales of fair trade products in Poland by the Polish Fair Trade Association (kg) (*Rzeczpospolita*, 04.05.2009)

Other examples of how fair trade is being promoted include conferences and seminars that have been organised (for example in November and December of 2005 at universities in Warsaw and Lodz, and the November 2008 conference where the idea of the Fair Trade Coalition was born). A number of articles relating to fair trade have been published, and although mainly in magazines published by organisations dealing with social and environmental issues or international economics. Some information on fair trade has also been included in the guides published by the PGN: *Good shopping* and *Buy responsibly* (see case study 14.C1). In 2008 the Fair Trade Coalition also prepared a number of dedicated educational materials.[8]

Growth prospects

The fact that the first fair trade products are available in Poland, and that informational and promotional campaigns are taking place, is a sign that the foundations for growth are in place. A comparison of the level of sales in Poland and in Western Europe, where the fair trade market is still experiencing dynamic growth, shows that there remains substantial potential for further growth in Poland.

Until recently, the main distribution channel of fair trade products were stores with certified organic food but this is slowly shifting towards medium sized retail networks (for example the Bomi delicatessen). Fair trade products are also appearing in large retail chains (for example Marks & Spencer), however these remain isolated cases in Poland. Expanding the sale of fair trade products within large retail chains requires senior level decisions made by the general management of foreign stores as well as the

[8] See <www.fairtrade.org.pl> for access to these materials.

cumulative effect of informational campaigns carried out by the growing number of organisations on international development.

Coffee shops and tearooms are also taking part in distributing fair trade coffee and tea, and in the future perhaps also confectionary will become active in this sector. As is the case in other countries it is possible that an independent distribution network for fair trade products will be formed, perhaps by the Fair Trade Coalition or one of its member organisations. The efforts of the NGOs that promote fair trade will result in increased demand for fair trade products providing the ultimate argument for large scale supply.

This increased demand is most likely to come from young and educated people, who are also most likely to make socially and environmentally responsible consumption choices. It seems particularly likely that this demand will come from students, and may involve a grassroots movement in promoting fair trade in schools and universities.

It is probable that the annual increase in sales will be significant, especially due to the low starting point. However, achieving significant levels of market penetration by fair trade products seems unlikely in the short term because of the barriers to responsible purchasing that are found in Poland.

Barriers

There are three main barriers for the development of fair trade in Poland as follows:

- a lack of knowledge regarding fair trade among consumers;
- low purchasing power; and
- a conviction that the social and environmental problems in Poland should be solved first.

Although lack of knowledge about fair trade is an important barrier, it is relatively the easiest to overcome, and all of the initiatives mentioned above facilitate this transformation. Furthermore, the lack of knowledge is not only evident among consumers but also among sellers. For example, there have been people running a store which regularly stocked fair trade products but who did not know what the fair trade label meant and had never even heard of the concept! These products were stocked solely due to the fact that they were also certified as being from organic agriculture. However, once people do find out how fair trade works, they often become very interested.

The low purchasing power barrier is a more difficult one to negotiate, which was confirmed by the research mentioned in section 14.2. Therefore, fair trade products should be marketed towards audiences who are relatively more socially and environmentally aware, such as those interested in a healthy lifestyle and personal development. Although fair trade products are currently more expensive in Poland than in Western Europe, with development of the Fair Trade Coalition that aims to import products directly to Poland, these prices are bound to fall.

The conviction that social and environmental problems in Poland are more relevant to local consumers and should therefore be addressed before thinking about fair trade has been mirrored in some West European countries. To overcome this problem, fair trade shops have introduced products from developed countries. However, these products are no greater than 10% of the volume of imported goods from developing countries, and the national products that have to conform to high social and environmental standards, still cannot compete with the other 90% of products that come from developing countries (Jeudy, 1998, p. 64).

Perhaps in Poland, promoting fair trade can be linked with highlighting the need and possibilities for resolving local issues. If the organisations of the Fair Trade Coalition

incorporate products made by local producers employing marginalised and handicapped employees, they can raise the interest of a wider group of consumers. In most cases, local and foreign products would not then compete with each other and indeed, most fair trade products are not in any case produced by Polish producers because of their exotic nature.

The barriers above despite still being significant appear to be less important, because the awareness of Polish consumers is growing, and this includes awareness of fair trade. The number of consumers prepared to pay a premium for fairly traded products is developing fast, and it is these consumers that are making 'changing the world' through their purchasing power increasingly popular. Social and environmental problems in Poland can also be addressed by fairly traded products and perhaps in the initial stages of the growth of fair trade market in Poland foreign fair trade products would only constitute a supplement to fair trade products made locally. Initiatives that are under way, in addition to implementing models developed in Western Europe will lead to a growth in the fair trade market within Poland.

Questions

1. What native Polish products could be sold as fair trade and why?
2. What actions can schools, universities and cities undertake to be labelled as fair trade schools, universities and cities?
3. Producers and workers in developing countries say that they do not need pity, but honest and just trade terms. What other means of 'voting with your wallet' can consumers in developed countries implement to help these workers?

Chapter 15.

Citizen activity networks

15.1. Introduction

What motivates people to become active citizens? In some cases the real experience of the consequences of a social problem is enough. For example, when a motorway is built near a settlement of bungalows meant to be a place of peaceful retreat, or if a forest where local people go for a walk is cut down, people spontaneously take action. Such people have declared: 'Not in my backyard'.

It is easy to criticise these types of actions for their limited, individualistic perspective, however, they can be good starting points for a wider social movement. Sometimes, charismatic leaders, often leading by example, encourage people to take actions. Nevertheless, such leaders can be difficult to find, especially given the more 'pragmatic' times in which we live, although the quest for self-realisation can encourage people to take action as well. There are still people who do not want to limit their lives to work, family and religion, and who feel like taking up the often tricky and thankless task of changing the world. If you are one of these people, then this chapter was written especially for you.

To become an active citizen, it is crucial to believe that an individual can change the world starting by his or her surroundings (see section 15.2) and one of the first steps can be to work as volunteer in a local NGO or charity organisation. However, the idea of volunteering is still not popular enough in Poland, as only 5% of adult Poles say they have worked at least several times a year as a volunteer (CBOS, 2007b), although Poles are more likely to render material help (44%) or financial help (43%). It is also likely that more Poles will help their neighbours in an informal way, without recognising this as 'volunteer work'. By comparison, in the United States in 2008, 26.4% of adults worked as volunteers amounting to 8 billion hours of social work at an estimated value of 162 billion dollars (CNCS, 2009). Robert Putnam (2000) noted that volunteer work is defined as doing something for the good of others, and that *doing something with others* is likely to lead to an increase in one's 'social capital', or network of social contacts (see section 15.3). In this chapter, we emphasise the ways for acting 'with others', and the founding of associations for sustainable development along with informal groups that aim to solve local problems. To exemplify these issues we discuss two case studies. The first is a 'Group of Certain People', a local, informal network that addresses quality of life issues in one of Poland's cities (15.C1). The second is the idea for thematic villages promoted in Poland by Wacław Idziak, a social entrepreneur alongside a network of his peers (15.C2).

Another form of civic activity is engagement in a social movement, which Zirakzadeh (1997) described as an egalitarian 'form of political activity by the non-powerful, the non-wealthy and the non-famous'. The activities of social movements include educational campaigns, dialogue with authorities, and, in extreme situations, political confrontation, such as the occupation of factories or creating roadblocks. Their activities, although illegal in some cases, represent a testimony to civic engagement and the building social capital.[1] The 'citizens' sector' (also known as the 'third sector') is a term for the institutionalisation of civic activities (see section 15.4). NGOs also take up an increasing amount of public work, and influence state policies in areas such as social

[1] Putnam named protest politics as one of 13 factors positively correlated with social capital.

inclusion, culture, and the environment. Creativity is an important factor that helps in solving social problems by drawing new perspectives (see section 15.5). In section 15.5, the ways in which social entrepreneurs handle difficult problems and change obsolete thinking patterns within a long-term and ethical perspective are also analysed.

Globalisation and the novelties which society experiences, such as new forms of work or development of new forms of communication technologies foster a certain type of activities while hindering others. Especially important is the increasing mobility of the people (see section 15.6), where it is more difficult to create strong associations of neighbours in a society where average citizen changes their residence several times. On the contrary, activism based on the usage of internet and community sites addresses the needs of developed societies which have become more 'nomadic' (tool 15.T1).

15.2. Just believe: the world is changeable!

In order to start acting as a civic activist, it is crucial to believe that we are able to change something in the world we live in, such as in our city, village, street or backyard. Polish people are especially gifted with pessimism that makes us complain more about politicians rather than doing something that will produce a change. In one street in Lodz, the inhabitants had a strong conviction that it was impossible to build a playground there, because someone had already tried and failed. The perspective of the creation of a playground returned with the arrival of new active people who did not know of the failed attempt.

Albert Einstein once noted that everybody knows that something is impossible, but by accident appears someone who does not know this, and this is the person who makes the discovery. With the solving of social problems, as with scientific discoveries, somebody is needed who does not know that something is impossible. Often these people are the newcomers who find it easier to escape the 'obvious world' (a term coined by Alfred Schutz) of their community, a world made from basic convictions and its patterns of interpreting reality (see mental models in section 2.1).

Einstein also worked out another important rule: 'problems of the contemporary world cannot be solved by the same mindset that created them'. Active people who believe in changing reality look for other ways of thinking, for instance, they perceive conflicts from a win–win perspective, and they are capable of dreaming: where others see an old barn, they can envision a future cultural centre. The social scientists who embrace the social constructionist perspective note that people do not live in one objective world, but are in the process of constant interpretation, and through common interactions develop common meanings (see section 2.2). From the perspective of the drive for sustainable development, mental models (i.e. convictions on the nature of the world) and concepts that we employ to interpret reality are of utmost importance for the outcome of our action. We refer to this question of narratives and their importance in a case study on the thematic villages network in Poland (see case study 15.C2).

15.3. The importance of social capital and mutual trust

Social capital is one of the most important concepts in contemporary social sciences. Pierre Bourdieu described this as a totality of the present and potential resources, which are linked in a more or less durable network of institutionalised social relations of dependence and respect (Frykowski, 2005, p. 21). Another sociologist, James Coleman, defined social capital as one of the resources that determines the capacity of an individual in terms of his or her family and community relations that foster education and

socialisation (Frykowski, 2005, p. 30). According to Coleman, social capital has two forms: obligations and channels of information (Theiss, 2007, pp. 14–15). To make this simpler we can suppose that if a person helps other people, he or she can count on a resource of potential help in return. The more relationships an individual has with other people, the easier it is for them to acquire information needed for example to work or to attend a demonstration. Norms and effective social sanctions are forms of social capital as they increase probability of a reciprocated action.

Robert Putnam is one of the most renowned writers on social capital and his starting point was a remark on the decrease of participation in neighbours' clubs, bridge clubs, or bowling clubs in the United States. In Poland, we can also see a decrease in the number of cultural centres or free time centres, especially in rural areas. In Ireland, people say that if a parish cannot find 15 boys to form a hurling team (hurling being an Irish national sport), a village is about to disappear. In the mountainous areas of Spain, there are plenty of abandoned villages. Usually, if migration causes the closure of a school, in few years time, everyone will have left the village. Putnam studied the influence of various factors in the decrease of civic engagement in the United States between the years of 1965 to 2000. Among the most important factors, he named generational change, television and the emergence of the TV generation, urban sprawl, and overworking (Putnam, 2000).

The most important distinction made by Putnam was between *bonding* (the exclusive) and *bridging* (the inclusive) social capital. The difference here is based on the attitude that local people have towards strangers. Bonding social capital is typical for small cities and villages and is said to be typical for Poland's 'family-type and not the citizen-type of socialisation' (Miszalska and Piotrowski, 2006, p. 152). As examples of such groups, Putnam (2000) cited ethnic organisations for mutual help, religious charity organisations or bowling clubs. In Poland, such groups include football fans clubs or business clubs.

On the contrary, the bridging form of social capital means reaching out and being open to people by forming different factions of society, for example, associations that promote universal ideas, such as environmental protection or human rights. Metaphorically speaking, we could say that if we enter an unknown bar in a suburban zone, and suddenly, everybody stops to stare at us, it is bonding social capital that dominates here. However, if the locals in the bar welcome us and invite us for a drink, we can be sure that bridging social capital is strong here. Putnam did not say that bonding social capital is bad but he stated that it increases the sensation of safety, although this can lead to antagonism between different groups. For example, in the city centre of Lodz, youths from one street who support one football team form a group based on mutual trust, and mobilise young people against the youths from a neighbouring street who support another football team. However, the need for bridging networks serves more than safety, for example they foster the flow of information and the mobilisation of peripheral resources. Bonding social capital serves usually defined reciprocity: in that I do something for you and you will do something for me in the future. Bridging social capital is based on generalised reciprocity: I do something for you now, but expect that in the future somebody else will help me when I need it.

One example of social networks that is based on generalised reciprocity is CouchSurfing, which is an international network of people who offer free accommodation and companionship for travellers. It aims at promoting mutual understanding between individuals who represent diverse cultures. As of July 2009, 1.25 million

successful visits took place, and 1.5 million new friendships were formed among which 90,000 are described as 'close' <www.couchsurfing.org>. Another example is a system of exchange of favours called time banks. Now in Poland, there are about 20 such time banks which are networks in which people help each other by offering different favours: legal advices, counselling, house renovation, or teaching foreign languages. These initiatives tend to have an informal character, and promote the integration of the community along with building of trust.

As far as the citizen sector is concerned, a social trust is an important factor because how can people do something together if they do not trust one another? As Daniel Goleman noted, affection, mutual kindness, and trust contribute to a social infrastructure that needs to be repaired and maintained in similar ways as pavements or wastewater treatment plants (Idziak, 2008, p. 151). Piotr Sztompka (2007, p. 263) distinguished two types of cultures: the culture of cynicism and the culture of trust. The former is defined as 'popular convictions in a given society about a common lack of credibility, which justify suspicion and mistrust as the proper attitude'. Sztompka defined the culture of trust as: 'popular normative rules in a given society that require trust and credibility, executed through social sanctions'.

Poland is still far from creating a culture of trust with only 7% of Poles saying that they trust NGOs, in contrast with 30–45% in Western Europe and over 50% in Kenya and Mexico (CBOS, 2006). Among the 20 nations surveyed, only Brazilians declared less trust in their government, and only Russians and Argentineans had less trust in business (CBOS, 2006). More Poles trust local than national government, but only 21% trust it 'a lot' whereas 56% do so 'a little', with most mistrust found among the younger generation (CBOS, 2007a). When it comes to that percentage of the population who have general trust in people, this since 1992 has been around 10%, less than in most European Union countries (in Scandinavian countries it approaches 70%; Czapiński and Panek, 2006, p. 259). Additionally, 89% of Poles do not participate actively in any organisation or club including local parishes (CBOS, 2007a).

Putnam (2000) stated that in the production of social capital, two types of social bonds play important role: formal and informal. He used categories from the Yiddish language describing formal bonds as *machers*, people who make something in the community happen. Often, machers are people from the upper classes who try to be 'good citizens', such as respected members of official social, professional, and charity organisations. Informal bonds are the domain of *schmutzers*, people who 'spend long hours chatting and communicating', and whose civic engagement is less focused and more flexible. Schmutzers often organise dinners for their friends, play cards and visit pubs where on these occasions, they discuss social issues. These categories do not exclude each other because each group may act in a formal or informal way, but with one of these tendencies usually dominating. Putnam observed that in American society, informal activism and schmutzers have gradually replaced the more formal activities of machers. In the case of the Poles, 10% are active schmutzers who organise parties and informal meetings, 45% of Poles only do this from time to time, and 30% never invite friends to visit (CBOS, 2007b).

Social capital, just like any other kind of capital (for example material or financial), can be misused. What are street gangs if not networks of people based on mutual trust? Putnam (2000) provided the example of the domestic terrorist in the United States, Timothy McVeigh, who detonated a bomb in the public administration building in Oklahoma City in 1995, and attributed the success of his action to the help of a wide

network of friends. However, there remain many more positive initiatives that serve to build social capital. Economists realised that a climate of mutual trust reduces investment costs, creates openness and fosters creativity. Moreover, good human relations guarantee a faster flow of information and last but not least, social capital is important in the activities of the citizen sector.

15.4. The character of the citizen sector in Poland

In Poland, the manifestos and documents that provide the framework for sustainable development emphasise that intergenerational justice and the development of an environmentally friendly lifestyle can only be achieved through joint actions by the state (public sector), business (private sector) and ordinary citizens (citizen sector). In Agenda 21, one of the priorities is to 'strengthening the role of non-governmental organisations: partners for sustainable development' (chapter 27).

The importance of the citizen sector varies from country to country because this depends on the political system, culture and history. For instance, in Scandinavian countries, citizens trust more in the state and expect more actions from it than in the United States or the United Kingdom. There is no doubt that the citizen sector is growing across the world which can also be seen in Poland.

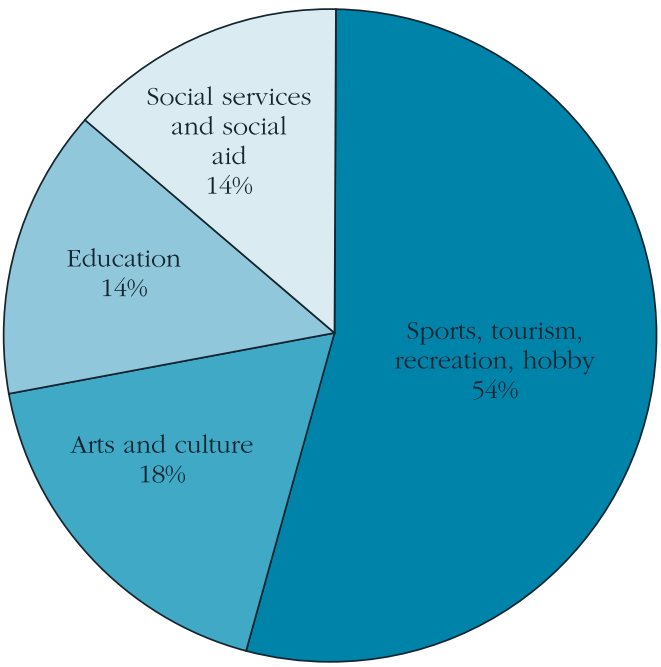


Figure 15.1. Areas of activity of NGOs in Poland (2008)

According to Polish state statistics (REGON) at the beginning of 2008, 58,237 associations and 9106 foundations were registered in Poland (their range is illustrated in figure 15.1). In Poland 120,000 people are employed in the citizen sector, totalling 65,000 full time job positions. However, more recent reports show a decline in volunteering among adults from 21.9% in 2006 to 13.2% in 2007, a worrying trend. As it stands the estimated membership in all types of associations in Poland is no more than 13% of the adult population (4 million) (Gumkowska and Herbst, 2008).[2]

[2] Data on the Polish citizen sector may be found at Klon/Jawor Association site: <www.civicpedia.ngo.pl>.

However, the official number of associations and their membership should not be treated as precise indicators of a civic society or of the quality of social capital. Firstly, some organisations are established by companies in order to promote their status as donors, and hence as environmentally friendly (greenwash) or socially engaged (bluewash; see tool 14.T1). Secondly, some NGOs are becoming de facto outsourced state agencies. These NGOs fulfil the tasks of public administration, and their hierarchical structure has more similarities with state agencies than to horizontal and egalitarian citizen structures. Another worrying process is competition between NGOs for scarce public funds as resources that they need to maintain their offices and employees. Thus the state, through its grant-giving policy, indirectly decides which problems the organisations will address and which they will not. Furthermore, some of these organisations are professional lobbies with only professional sector goals, for example, the Association of Mining Technicians and Engineers has 14,000 members (Gumkowska and Herbst, 2008, p. 9). Last but not least, very active individuals often participate in several organisations at the same time, thus distorting the statistics for activity for the entire sector.

In citizen activities, a key factor is the ability to cooperate and manage projects and these abilities can even be taught at school. For example, the Centre for Citizenship Education offers such programs, encouraging pupils to take up journalism and cyber activism, the study of global interconnections, and the human rights, promoting the 'watch and change' approach.

Tool 15.T1.
The internet and social actions

Like human creativity, the internet is a tool that can be used in multiple ways: to promote a lifestyle based on rapid consumption, or alternatively to increase citizen awareness. Thanks to the proper and widespread usage of the internet, in 1995 millions of people knew about an insurrection of indigenous people in the Mexican state of Chiapas in their struggle for water, land, work and cultural rights, which gave a boost to an international network of solidarity committees. According to Manuel Castells, we live in a network society, the distinctive features of which are the widespread use of new means of communication and the dominance of services in economic activity. Through their use local citizens' organisations form more easily, and big transnational networks and NGOs, such as Greenpeace, the WWF or Friends of the Earth can count millions of members. For example, Greenpeace has a network of 2.6 million members in over 40 countries subscribing to the organisation's aims of countering climate change, protecting the world's oceans and forests, and promoting the development of renewable energy and sustainable agriculture. The WWF as the largest environmental protection organisation, counts 5 million members and has 90 offices on 5 continents. Ashoka is yet another international network with representatives in 51 countries.

Bonds created by virtual membership need further analysis and in the case of mass social organisations on sustainable development, we can see membership that is based on symbolic identification, juxtaposed to a membership that is based on personal networks (Putnam, 2000). Putnam compared two antagonistic movements in the United States: one

supporting abortion (pro-choice) and one opposing it (pro-life). The pro-choice movement was based on symbolic identification, whereas the pro-life movement had a nationwide personal support network of local parishes. Pro-life PR experts used the 'land war' strategy that emphasises spreading information by using personal contacts and 'real world' meetings. In contrast, the pro-choice movement to a great extent mobilised individuals form big urban centres, and preferred the 'air force strategy', that emphasises the intermediary status of the media to approach people living in milieus lacking in social capital. Generally speaking, people who are mobilised without employing personal networks tend to have less stable membership and activity because of a lack of social control within their immediate environment, and consequently, were less eager to fully dedicate themselves to the cause.

Putnam (2000) proposed the category of 'third range organisations' for organisations like Greenpeace and others that use direct marketing to gain the support of millions of dispersed members. According to Putnam (2000), membership of this type of organisation is of symbolic merit that serves to raise more funds, with these bonds described as a 'membership based on a bank card'. The American organisation, the National Audubon Society (NAS), was a pioneer of this type of social marketing. It sent out 1 million invitations to potential members between the years 1965 and 1971 and as a result, saw a fourfold increase in membership (from 50 to 200 thousand). Using this kind of strategy, Greenpeace sent out 48 million letters in 1990, although its letter-based membership turned out to be too short-term. As compared to 1985, the number of members rose in 1990 threefold but 85% of them had left the organisation within the following 8 years. The identification with a group and the engagement of members recruited by letters or e-mails appears to be weaker than one of people that know each other from a parish, a bar, or cultural centre. Christopher Bosso called this new type of member the 'consumer of right causes', who acts according to a market axiom and follows trends, disposing of virtual membership like any other used product (cited in Putnam, 2000).

In order to have a larger picture of the situation, we need to acknowledge that some networks came to existence exclusively thanks to use of the internet and virtual membership. In 2007, the networks 'Avaaz!' and the 'World in Action' that specialise in internet activism gathered more than 100,000 signatures of people worldwide within few days to influence the World Bank board's decision to dismiss its president Paul Wolfowitz because of suspected corruption. Organisations such as Greenpeace or Amnesty International also activate their members through internet protest lists. Alongside these there are local networks, such as the Group of Certain People in the city of Lodz, that use the internet not only to organise protests but also employ it as a forum for discussion and the coordination of activities (case study 15.C1). The milieu of fans and practitioners of thematic villages also has its own internet forum (see case study 15.C2). The internet serves then to coordinate activities between people who do not know each other, and also helps to engage strangers. In conclusion virtual social networks based on a symbolic nature of membership have weaker bonds than groups of people who know each other personally, but they do mobilise people who otherwise would not participate in citizen activities, since their time budget may be limited to 5 minutes a day to sign petitions.

15.5. Social entrepreneurship, postmaterial values and creativity

The international organisation Ashoka took up the task of promoting the idea of social entrepreneurship, and creating a worldwide network of social entrepreneurs, people who prepare breakthrough solutions for social problems to implement them on a large scale <www.ashoka.org>. Ashoka invests in their activities which bring not financial profits but social ones instead. To become an Ashoka member, a social entrepreneur must solve a social problem, and encourage the entire community to take actions. Additionally, he or she is obliged to prove that the proposed model of social intervention is highly ethical and universal and possible to implement with minor changes in various countries.

As Richard Florida noted (2004, p. 6), 'access to talented and creative people is to modern business what access to coal and iron ore was to steelmaking'. He observed the rise of a 'creative class' (which comprises of just 10% of the Western societies) who are highly educated, independently thinking people who opt for autonomous jobs. These people prefer to work in a flexible way, and often after hours to get the best ideas. They subscribe to postmaterial values, such as freedom of expression or quality of life and as an alternative to the values of industrial society, with its emphasis on material values (i.e. 'survive and then get rich'). These categories were first proposed by Ron Inglehart who, in his *Silent revolution* (1977) and World Values Survey (conducted every 5 years since 1990, <www.worldvaluessurvey.org>), revealed the changes that Western societies have undergone in this time. Two important changes are the emergence of new social movements (environmental, feminist and human rights), and an increase in material wealth. As a consequence, more members of the new middle class engage in the struggle for values not connected with their material situation.

From the creative class emerge the leaders of new forms of citizen initiatives that are often international in character as they use the internet, and demonstrate bridging social capital. Examples of this are the open source, and the global commons movement. People within these like to form communities and choose places to live that offer them access to the outdoors and to an interesting cultural milieu. They often chose big urban centres, which offer the '3T', known as technology, talented people, and tolerance.

Having read Putnam's study of civic engagement, Florida has highlighted that faster economic and population growth, as well as greater technological innovation (measured by the number of registered patents), has been observed in regions where the quality of social capital is surprisingly low. A collaborator of Florida, Robert Cushing has analysed the leading high-tech industry regions of the United States and discovered that they scored badly in 11 out of the 13 indicators of social capital employed by Putnam, and these include trust, reliance on faith-based institutions, clubs, volunteering, and an interest in traditional politics (Florida, 2004, p. 274). At the same time, these regions excelled in two measures of social capital, 'protest politics' and 'diversity of friendships'. Conversely, in regions with low levels of creativity and lacking in high-tech development, social capital was found to be abundant. People here manifested a preference for 'social isolation' and 'security and stability', and had little tolerance (such as acceptance of multiculturalism or gay partnerships).

Florida has accused Putnam of a romantic nostalgia for the 1960s, by stating that creative class members do not miss bowling clubs and communities of bygone times,

whilst avoiding the anonymous lifestyles and the social atomisation of high-tech centres, such as the Silicon Valley. These 'creatives' interviewed by Florida expressed a need to live 'a real life in a real place', but in an inclusive community, or a new type of community 'having potential to combine innovation and economic growth with authentic community and a better way of life' (Florida, 2004, pp. 281–282). With the examples he used, Florida demonstrated that a community open to migrants and social minorities, with extensive bridging social capital, may attract the 'creative class'. It is a challenge for the future to create these open communities and associations that could provide attractive alternatives to individualism and anonymity, and attract a wide range of people, including creative types and entrepreneurs.

15.6. Summary and conclusions: citizen's activities in the times of weak ties

Zygmunt Bauman (2001) highlighted that we now live in times of great disengagement, that are of high velocity with reduced obligations, flexibility, and employment alongside the outsourcing of responsibilities. These are times of ad hoc partnerships which last only as long as they bring satisfaction (and no longer). Another sociologist, Richard Sennet (1998), emphasised the consequences that the rules promoted by the modern economy have for social life. One of these rules is the slogan 'nothing for the long term', which prepares people for dynamic changes and restructuring, for example Americans change their work 11 times on average and their profession 3 times in a lifetime (Sennet, 1998). Poland, through participation in the European Union, follows the same model of a mobile society, with a 'not for the long term' character of work and residence. Sennet concluded that superficial cooperation and indifference are better tools to cope with the modern reality than actions that are based on values such as loyalty or service. Mark Granvoetter is the originator of the concept of 'weak ties' as a characteristic of contemporary society, such as temporary forms of association and superficial networks that are more useful to people than long-term connections. We should be aware that the transformations that occur in the labour market, such as irregular working hours and the disappearance of free time, affect the nature of civic activities. These changes need to be taken into account when proposing new approaches to engage people.

Technological progress and economic transformations reduce geographic distances and threaten natural communities that are self-sufficient and to a greater degree separated from the rest of the world. One side of this process is the decline of local clubs and organisations, on the other hand, the divisions of 'us' and 'them' are disappearing, making space for universal ideas. The inhabitants of our planet recognise their similarities and common fate, linking local patriotism with global engagement. Therefore, it is not enough to 'think globally and act locally' because problems such as climate change need also global actions and solutions.

We can no longer count on an idea that throughout our lives we will have friendly neighbours as long-term witnesses of our lives. Nor can we count upon having a regular job, since flexible forms of self-employment are now preferred and big companies that used to be symbols of stability can disappear in a moment. Consequently, people desire at least some sense of community that can be acquired through participation in a social movement or thematic forum on the internet. Civic organisations adapt to the times we live in, and to the fact that it is difficult to maintain the long-term and strong engagement of people in anything. Thus, they offer informal internet groups and 'instant' petitions

that are ready to be sent. If we want to change the world, it seems more efficient to adapt creatively to our wider environment.

Nonetheless, mutual trust and social capital, the networks of acquaintances and people ready to participate in actions will play a big role. Poland is a state with low indications of trust, and therefore has lots of room for innovative forms to build trust and activate people. The message of this chapter is very clear in that we do not have to be merely consumers, even if responsible and reasonable, because we can also change the world in multiple other ways. The following examples from the Group of Certain People and the thematic villages network are just two of millions of examples that are evidence that the world can actually be changed and if we keep to our commitment we will see the fruits of our actions. We also highlight the challenges and do not claim that this is easy but we do invite you to join an exciting and free civic adventure.

Practical resources

<www.changemakers.com> the open, global forum for discussion and creation of solutions for social problems according to Ashoka's slogan, 'everyone is a changemaker!'.

<www.volans.com> Volans works globally with entrepreneurs, businesses, investors and governments to develop and scale innovative solutions for financial, social and environmental challenges.

<www.avaaz.org> this is a good place for internet activists, with petitions on everything from global warming to solving armed conflicts. Anyone can begin their own petition there.

<www.petycje.pl> a Polish website where you can publish your petition and sign up for numerous petitions started by others. Causes that you can support include introducing organic eggs to supermarkets and creating bicycle paths.

<www.challengeSD.eu> a community portal aimed at professionals of sustainable development; it facilitates planning, initiating and implementation of practical projects, as well as grants access to numerous resources and useful contacts.

Questions

1. Who can you trust? Who will you ask to take care of flowers in your apartment during your absence? Does your experience confirm that people in Poland only trust their closest family?
2. Think about the networks in which you participate. Are you active in some organisations? Do you work? Do you participate in some the graduate networks of your school, university or training courses? Do you use community sites? Think about the ways you could employ your networks to promote sustainable ideas.
3. Using the community site <www.challengeSD.eu>, try to contact other people interested in sustainability and try to develop some actions with them.
4. Define and describe the basic notions of social capital, social entrepreneurship, social constructionism, local community, institutionalisation, and the informal group.

Case study 15.C1.
A Group of Certain People (GPO)

'Each individual can influence the small world in which he or she lives', this slogan was announced by a group of young people who started to act together in Lodz (in the centre of Poland) between the years of 2006 and 2007. On their website, they declared that they considered themselves a Group of Certain People (Grupa Pewnych Osób, GPO), to which 'you also belong, even though you do not know it'. According to one of their members they were just 'a group of people who care about the city they live in'. The Group was rather cautious regarding involvement in local politics, and focusing itself on solving specific problems. The idea that united them and called them to action was to make the city attractive (i.e. protection of historic sites), clean (through actions such as cleaning the old cemetery or preventing illegal posters on buildings and bus stops), green (actions promoting the bicycle as the urban means of transport, and even guerrilla gardening) and interesting (promoting Lodz as candidate city for a European Capital of Culture 2016). One of their biggest successes was the rise of local patriotism by encouraging more city inhabitants to start to like their city. As Majka, one of the Group's members, said, 'GPO makes people interested in things that they were not even thinking about before, such as the lack of infrastructure for bicycles in the city. The GPO reminds people that our city is unique in the world and although its history is not long, it is no less interesting than the history of Krakow or any other place. More and more people realise that we live in a city worth caring about.'

The Group decided not to formalise its existence as an association or foundation, and instead chose to remain as open as possible to the activity and ideas of newcomers. In this case study, we describe the activities of the Group, its communication strategy, and its successes. We also discuss the possibility of creating similar groups in other cities. We cite the opinions of Group members, from an internet survey that had open questions and stimulated spontaneous reflections.

Who acts in the GPO?

The Group is comprised of young people, students, and professionals who tend to work in professions typical of the creative class. As a Group member named Becik noted, 'we are all united by an interest in Lodz. Our diversity turns out to be very beneficial, as each of us is interested in different topics, which allows us to share knowledge, and act on many, apparently different fields.' The GPO could be described as a postmaterialist movement because of its emphasis on the aesthetics of the city, its green spaces, the development of cycling infrastructure, its cultural attractiveness, and the lack of focus on the economic situation of city's inhabitants.

Problems that they raise

The aesthetics of the city appeared to be a core category for the Group. For example, some of its activists who were amateur filmmakers helped police to catch a man who had been creating dirty spots on buildings for years, and removed illegal posters from the city centre. Their 'aesthetic happenings' also led to the dismantling of a metal box on the main commercial street and the Group organised several guerilla gardening actions with the spontaneous planting of flowers in public places.

In 2008, the GPO organised a popularity contest called 'Black Spots' for places that brought the most shame to the city, such as holes in pavements, buildings in a bad state of repair, and the remains of cut down trees. The Group published a booklet with a map

of the city's shameful places, and gave it to the city administration. This action had quite a large impact because 200 places were identified in the contest and the municipal authorities received the clear message that the citizens cared about the quality of sidewalks, roads, buildings, and parks. The Group considered these actions as a form of monitoring city authorities, and acting as a watchdog organisation. In the words of Becik, 'the GPO shows that we are not only interested in creating new things in the city, but also that we are interested in what the authorities are doing, and what decisions they are taking'.

In 2009, the GPO proposed an affirmative continuation of 'Black Spots', an action known as 'Point for Lodz' that aimed at rewarding the 'extraordinary attitude towards aesthetics, to uplift the aesthetic norms of society'. Among the winners of the contest were urban activists, art galleries, and property owners who successfully repaired and decorated their buildings, backyards, neon lights and signboards. These actions were performed under the auspices of the CommunityPlanning.net, an international network fostering an exchange of good practice in social participation in urban planning.

Remarkable activities were conducted by a Group in Lipowa Street, that had dense urban architecture and, like most streets in the city centre of Lodz, inspired with the beauty of its decay. In their declaration on the 'Lipowa Renewal', people form the GPO announced that their project aimed at social revitalisation of inhabitants of Lipowa and its surroundings, and that their activities tried to convince the community that people can influence the image, infrastructure, and the spirit of the place that they live in <www.lipowa.org>.

The Group organised a picnic and started a campaign to build a playground (which the street lacked). At the 'Lipowa Renewal' picnic, together with local children, the activists made a plan for the future playground, and looked for the best place to locate it. A survey was conducted among local people on the best ways to use the empty square that they chose for the playground. Then, the Group convinced the municipal council to finance the project. A good outcome from their activities was that Lipowa Street was presented in a positive light as a street that had a place for picnics and cultural activities, before this the street did not have a positive image. Similarly, another street in Lodz, Wschodnia, that was notorious for the illegal trade in alcohol but managed to improve its image thanks to a festival called 'The Sun Rises in Wschodnia', that was organised by the Białe Gawrony Foundation ('White Crows') and in collaboration with the GPO.

The effects of the activities

When asked about the outcome of their activities, the GPO members unanimously cited raising the awareness of the inhabitants, politicians, and the media, and reaching them with a message that the outlook of the city and its quality of life depended on each citizen. In the particular context of Lodz, it was significant that most inhabitants believed that their city was dirty and uninteresting, which resulted in a lack of care for the city's aesthetics. Therefore, the significant rise in local patriotism was an achievement of the GPO. Moreover, through their pressure illegal posters had also almost disappeared form the city centre.

Becik also pointed to a 'development of social dialogue between authorities and citizens', by referring to 'commissions, in which social activists interested in particular subjects are able to discuss these topics with authorities, and have their say'. Members of the GPO established dialogue with city authorities in the framework of commissions on the character of the main street (Piotrkowska commission), and the cycling

commission, which developed standards for cycling infrastructure. The Piotrkowska commission developed a strategy for street development, in proposing high aesthetic standards for businesses and incentives for creating green spaces. As another outcome of the GPO activities, Becik suggested 'integrating the activities of several NGOs whose representatives are active in the GPO'.

The strategy for communication and activity

The strategy of the Group is to emphasise its egalitarian character and the effective use of electronic and audiovisual means of communication. Officially, the Group does not have a board, coordinators or press speakers, and although there is a hierarchy in the Group, it is minimal and hidden.

To communicate with the wider world, the Group uses its blog and two mailing lists, one for the most engaged leaders and one publicly available for some 500 supporters. In these forums, some decision making takes place, but they also grant the Group a high level of transparency (anyone can join them and study their archives). The existence of two separate lists is justified on practical strategic and personal decisions taken on an exclusive mailing list, and real-world meetings with leaders. The publicly accessible list fostered the effective flow of information, opinions, and ideas for actions among all Group members and also increased identification with the Group.

Moreover, the Group used an electronic bulletin and social networks, such as Facebook, to spread information. Its members created audiovisual recordings of their actions and quickly published films and pictures from their actions on the internet. An important aspect of their activity is a media strategy for representing the Group, with an egalitarian form. The members who speak in the name of the Group use only their first names (for example Michał from the GPO) to emphasise the Group and resist the temptation to promote the individual.

Why did the GPO not register itself?

Closely linked with their media strategy is the Group's decision not to institutionalise its activities. As Majka explained, if the GPO had formed an association it would have lost an opportunity to attract new members, 'so we just said: "Join the mailing list, look at what we are doing, and start to act." Otherwise, we wouldn't be able to say that everyone belonged to the GPO even if they do not know it.' Institutionalisation poses a threat of losing the power that spread from the boundlessness of the initiative. It would also mean the loss of its mysterious character as represented by its slogan, which suggests that whoever cares about their city is already a member. The introduction of formal membership and fees might increase the quality of engagement of some members, but would reduce their number. It would meet resistance from many people who, like Becik, believed that 'formal registration may have led to a perception that we wanted to be seen as elites, and this we wanted to avoid'.

The GPO proves that an informal initiative can become a serious partner for the city authorities. The officials recognised the GPO as a social partner, and started to invite group members to discussions on the promotion strategy for the city, and the strategy for the preservation of its green spaces. The Group had resources that the city council welcomed, such as a positive image among local people, interesting and unconventional ideas, knowledge of the history and the highlights of the city, and extensive social contacts. Therefore, municipal authorities recognised the Group as a perfect partner in actions designed to promote the city. For instance, the Group was well known for conducting the technically illegal actions of planting flowers in public squares. However,

in the spring of 2009, the promotion department of the Lodz municipality purchased flowers, and asked the Group's members to plant them as part of an action designed to promote Lodz as a candidate city for the European Capital of Culture 2016. The Group and the municipality also launched the common campaign 'Lodz as a Magnet' aimed at taking pictures from holidays with the 'Lodz magnets'.

However, a lack of institutionalisation does have some weaknesses. First of all, the Group cannot apply for public or private funding. The GPO had a strong message that it was enough to want to change the world locally to produce significant changes and that money is not so important. The Group proved that it is was capable of mobilising strongly committed citizens to clean an old cemetery, organise a picnic or improve the aesthetics of the main street.

Another argument for institutionalisation is that in order to organise certain things (for example blocking a street during cyclists' demonstration) it is necessary to have legal registration. Subsequently, the informal leaders of the GPO opted for a solution that would allow for an increase in the scope of their activities without sacrificing openness of the initiative when they registered a foundation called the Normal City Phenomenon ('Fenomen'), but which preserved the present form of GPO. As Patrycja Wojtaszczyk from 'Fenomen' explained, 'our foundation is 100% the result of the meeting of people at GPO actions. At a certain point it became clear to some of us that we wanted to act more intensively, for example training city representatives and designers in cycling infrastructure so we needed legal representation.' Nevertheless, the leaders decided that 'the GPO are normal people, and city dwellers' and the Group should preserve its inclusive and egalitarian form. Most of the members seemed to accept the attitude expressed by Szymon: 'It is most important to act whilst the name under which one acts can be developed later.'

What can other groups learn from the GPO?

Although the GPO is a locally-oriented social movement, the solutions that they developed could be applied in different contexts. The GPO members link local patriotism with a bridging type of social capital that do not foster hostility between cities, and they want to help visitors alongside the inhabitants of Lodz to discover the beauty of their city. The distinctive features of the GPO include the egalitarian structure with its collegial, informal type of leadership, political neutrality, and attractive activity-based model of work. The GPO is a social network that builds bridging social capital where everyone can join them and participate in the activity. The GPO did not come from a group of people who know each from attending university classes or a local bar. The GPO leaders were initially unknown to one another, and knew each other by nicknames on the internet forum of a local newspaper. Thanks to common activities, they got to know each other and formed friendships.

The GPO has a local character and limits itself to activities in one city that is never lacking in problems connected with aesthetics and quality of life. Szymon stated that the GPO developed 'a model applicable to any other place, especially in Poland'. According to Szymon, 'Western countries have developed effective tools of communication between the government and society but we have just started to learn this and the concept of direct democracy remains almost unknown. Also the municipality's officials are learning to accept our activities which opens up possibilities for cooperation as the next step. We are lucky that anything positive that happens in Lodz is immediately noticed, and people become eager to join. In order to create similar groups, several leaders are needed. Then

some skills are also needed, such as talking with the media or with officials, and these skills can be learned.' In referring to the concept of indirect democracy, Szymon was probably appealing to the influence that inhabitants can have on their city through monitoring authorities, citizen interventions, and grassroots mobilisations.

The GPO representatives together with other groups from large Polish cities formed an initiative called 'common ground' creating platform for common action on activities for improving quality of life and aesthetics in the cities. Although the group presents locality as a value, certain problems need legal solutions at the national level, for example rules concerning cycling. Common among the goals of the activists and those of scientists can be found the creation of a new curriculum of study called the 'culture of space'.

To conclude, the GPO acting as an informal social network, had certain achievements in promoting positive attitudes among urban citizens encouraging them to become local patriots, leading to the almost full elimination of illegal posters and influencing of the activities of the authorities through participation in commissions. The GPO has also been fertile ground from which other initiatives are growing. One of them was the aforementioned 'Fenomen' Foundation and another is the 'Respect for Lodz' movement focused on the revitalisation of the industrial heritage of Lodz that guards against the demolishing of monuments and organises rescue actions for them.

Finally, we should emphasise the links between the aesthetics of the city and sustainable development. The more attractive the city is as a living space, the more it attracts investment and, especially the creative class members. This can even help to prevent urban sprawl because if people feel comfortable living in their city, they create bonds with the place and are less eager to leave (see chapter 10). Moreover, Richard Florida has emphasised that creative class members prefer to settle in cities with abundant green spaces, a climate of tolerance, and unique facilities, such as reclaimed factories or jazz clubs. In contrast, cities that do not have anything unique to offer focus on attracting big commercial centres, great stadiums and wide roads, but keep the creative class at a distance.

Questions

1. Taking into account your own experience and that of the described group, think and debate with your friends: does it make sense nowadays to create formal associations? And if yes, in which situation does it start to form?
2. How do you evaluate the influence of the internet on social activity? Does the internet open up new possibilities for getting to know people and joining up? Do the 'real-life' meetings bring some added value to an organisation's members? Could an organisation active in rural areas find the internet as equally useful as an urban organisation would?

Case study 15.C2.
Thematic villages

Just a few years ago, Sierakowo Sławieńskie near Koszalin in Pomorze Province, a northern region in Poland, could have been seen as a typical Polish village with few prospects. To make matters worse for the village, the situation in agriculture was unfavourable, and it was situated in a peripheral zone, with high unemployment. The distance of 30 km from the coast was too far to attract tourists. Furthermore, the village could not offer any special natural capital (such as lakes) or cultural capital as the inhabitants were settlers who had been brought there after the Second World War. Luckily for the village, Wacław Idziak, a social entrepreneur who left a governmental agency to try a grassroots approach to rural development, became interested in the village.

Today, Sierakowo is well known in Poland as a village of Hobbits, one of five villages in Pomorze Province linked by a common network of cycling tracks. In 2008 these five villages were visited by 20,000 tourists, and by 2009, the number increased to 25,000. In Sierakowo, a new story for the village was developed. The residents travelled to England to study the Tolkien Trail, and for local children it became normal that 'mother works at the Hobbiton'. In this text, we outline the idea of thematic villages and the philosophy of mobilising village inhabitants that Idziak and his collaborators applied to creating specialisations. We also outline the outcome of the project.

Thematic villages and sustainable development

The roots of village specialisation can be traced back to medieval times where in the names of certain villages this is well reflected, for example Kowalewo refers to the profession of the blacksmith. The contemporary form of consciously creating specialisations is now developing dynamically in Europe, the United States and in Japan. One of the first successful thematic villages was the Austrian Großschönau, which thanks to its location between two rivers specialises in services connected with a healthy lifestyle and bioenergy, and it organises fairs attracting around 30,000 tourists annually (Idziak, 2008, p. 75). Poland, just like other developed countries, has experienced an increase in the service sector, with a subsequent decrease in industry and agriculture. In 1931, 70% of professionally active Poles worked in agriculture, while in 2000 this was only 28%, and in 2008 this was less than 14%. In the most economically developed countries, less than 5% of workers now find jobs in agriculture. In Poland in the last 20 years, village residents have had more limited access to culture, information or educational services. Therefore, the 'thematisation' of villages is a way of adjusting these villages to the global economy, where the service sector dominates, without sacrificing natural resources and culture.

Idziak emphasised that in a contemporary economy that promotes creativity, ingenuity and emotions, it is necessary to offer an interesting story about a product or in this case a village to attract people. Creating thematic villages assumes a change in the story that people tell about the place they live, where a narrative of a village evolves from a 'normal village where nothing happens' to a unique village of storks, humour or Hobbits. However, this story should not be brought by the external experts, but rather created together with residents (including children, who are often the only one who dare to present crazy and unconventional ideas). Creating a new concept of the village and a specific offer of services in the village assumes mobilisation of the local community. Local people experience empowerment, and their creativity is liberated. Local

institutions, such as schools, became vital actors in village development. Villagers change the story about themselves and their village and are encouraged to care about the village and its outlook.

The concept of thematic villages complies with the principles of sustainability. Stimulating economic development of villages results in the decisions by more inhabitants to stay where they live and thus provide better chances to preserve village institutions, such as schools or cultural centres. Additionally, these places receive new roles as centres of knowledge and activities that serve all the residents. Idziak promoted the idea of using non-material values, such as emotions and adventures, which are awoken by action games to improve the villagers' economic environment (see chapter 8). Another important aspect of specialisation of villages is the development of human capital, mostly through adult education (and self-education) with the intention of using knowledge locally. The inhabitants of Sierakowo who participated in the organisation of the action game received training and practical experience to become animators in plays, and were subsequently invited to other villages as experts. Thematic specialisation supplies local people with new jobs, and new definitions of their social roles. Furthermore, Idziak engaged in the work of village specialisation with students and artists who then pass on their skill to villagers.

Inhabitants of Sierakowo and neighbouring villages established their own associations, and thus became active members of the civic society. Their associations formed the partnership Together ('Razem') and they learned to collaborate with NGOs, companies and local authorities.

Caring about local culture and the agricultural landscape is another key aspect of thematic specialisation. Local people and their representatives in local government learn to appreciate the values and aesthetics of the village agricultural landscape as tourists appreciate them. Tourists who become attracted by the non-material offer of the village may also be interested in purchasing eggs or milk from local farmers. Idziak tried to hamper urbanisation of villages, subsequently encouraging villagers to offer services connected with health (both physical and mental) and education for urban customers. Part of the school education for urban children can be performed on these educational farms. For instance, in the village at the End of the World in Iwięcino, local women offer classes on Christmas traditions to children from schools from a large city 100 kilometres away. Customs that survive appear to be a valuable resource, and the residents are motivated to look for old traditions and restore them. This pure reality can be an interesting resource for the urban youth, who experience a far-reaching virtualisation for life (Idziak, 2008, p. 122). Getting to know and to feel the 'real world' increases environmental awareness.

How to create a thematic village?

A thematic village should be a long-term initiative, built in a collaborative way as a group alternative to the individual village businesses, such as breeding ostriches or snails. The attitude that Idziak represents requires thinking of the village as a company that must identify its own strengths in order to compete in the global market.

A theory that appears to be useful at creating new village specialisations is social constructionism. As Idziak (2008, pp. 112–136) proposed, 'if we want to change something in our village, we should start with changing what we say about it'. Talking about the village as a place where everything has to fail 'creates explanations that prevent us from acting'.

A future vision of the village should not be created in the city but should be a fruit of the common will and imagination of the villagers. Idziak and his collaborators prepared an appreciative inquiry that was developed among others by Martin Seligman. It assumed concentration on what is good, looking for the strengths of the people and the village, small things to be proud of with positive emotions. For example, if we look for possible resources, we can see the positive sides of unlit streets that a village endures, such as excellent conditions for creating an astronomical observatory. Idziak recommends a positive emotional attitude towards inquiry, techniques that 'open the heart', such as games, chants at a bonfire or engaging children in the discovery of hidden resources in the village. If we appreciate the inhabitants and their knowledge, it will be easier to get them to act for a good cause. In work for the future of the village, the most important persons in the village should be engaged. Reinterpretation also poses new questions on the future functions of village resources, such as stables, creeks or day rooms. An old ruined barn in Iwięcino for example became a gallery for crafts, and in Podgórki, an old stable became centre of games, banquets and conferences. Material products, such as potatoes, could also be reinterpreted and gain an extra value as 'potatoes from the village of the Hobbits'.

In order to work together with the villagers on specialisation, Idziak invited people to create 'mind maps', and collect all their ideas in order to choose the one that offers the best possibilities. Analysing specialisations worldwide, Idziak recognised those which are connected with the following:

- traditional farming, breeding animals and food processing (villages of poppy seed, pumpkins or sheep);
- traditional crafts (village of blacksmiths);
- particular story (village of witches or stone circles);
- artistic creativity (village of jazz or theatre);
- nature or landscape (village of lilac or rivers); and
- knowledge and personal development (village of books or kindness).

In the case of Sierakowo, the choice of Hobbits as a specialisation theme had a metaphorical justification: Hobbits personalise traditional local communities that lived for ages until the moment when some exterior events (in the case of Sierakowo economic changes) forced them into new adventures. Other traces included the existence of a megalithic tomb near Sierakowo, and the Baltic roots of Tolkien's family. Although these traces are loose, they imply a 'syntopy', which means 'a new, creative setting for existing elements and non-conventional interpretation of differences, tensions and problems'.

The effects of the activities

Thematic specialisation of villages, creation of new social roles and jobs, and changes in thinking about the village and oneself are long-term processes but even at this early stage we can reveal some successes of Idziak and his collaborators in the 'Together' Partnership. Idziak himself, when we asked him about his successes, mentioned the 'creation of five associations' and added that 'people believe that it makes sense to act from the bottom up. Here, silently, a civic society and a social economy are born. Despite resistance people start to learn and develop because they know they can do a lot without asking the local authorities for permission' (personal communication).

Those who were earlier afraid to talk, such as the housewives from Iwięcino, are now teaching Christmas traditions. The villagers made study visits to England and

Germany where they were inspired with unconventional ideas for rural development. The hobbit Village counts for a huge tourist interest (with 12,000 visits yearly). They managed to engage the local school in the creation of a theatre play about hobbits although they failed to save the school. They managed to launch an old forge and train a blacksmith, and build Hobbiton, a set of buildings serving for an action game based on the volunteer work of the residents. The pure fact that such an extraordinary idea was implemented in a peripheral village has been a success, was the fact that the village became famous and its dwellers got jobs. As Gandalf, one of the villagers working at Hobbiton said, 'thanks to the Hobbits the village has changed. And I have changed. I used to sit all the day watching TV. I knew the TV programmes by heart. Now I don't remember when I last watched TV' (*Gazeta Wyborcza*, 05.08.2008). Troll points to the development of the local economy: 'On Hobbits? What I appreciate most is that all the money stays in our village. Our women are cooking, our shopkeeper sells beer and our music teacher of performs. The money stays in our community and does not leak out.'

The village inhabitants started to use the internet as an educational resource (for example to learn new kinds of games), and as a forum for collaboration with other thematic villages in Poland and abroad. They acquired skills to train others and gained new social roles (as animators, and live action role-playing games experts). Thus, a social entrepreneur initiates a long-term process through the creation of thematic villages engaging hundreds of people. Idziak emphasised that 'without a team and collaboration with multiple people, such initiatives fail' (personal communication). The national thematic villages network now includes scientists, local authorities, students, and artists who serve with their time and ideas. The idea is also very contagious. Now there are more than 50 thematic villages created across 9 provinces in Poland. Work on thematic specialisation of villages helps in to construct bridging social capital where the villagers become motivated to learn,, open up to the wider world, and are more eager to host students who can work together with them.

Questions

1. What kind of resources are available in your local community? What kind of social capital can you identify there? Could the idea of thematic specialisation attract your neighbours?
2. Find five names of villages in your country and consider what kind of specialty with regards to the principles of sustainable development that could be developed there, on the basis of their names. Then have a brainstorming session about this with your friends. Write down your proposals using the mind mapping method. Which proposal appears to be most powerful?
3. Live action role-playing (LARP) games, such as Hobbiton in Sierakowo, can be successful in attracting people to a certain place. Search the internet for examples of games that take place in the real world, and discuss them with your friends. Maybe you can come up with a game that promotes a particular aspect of sustainable development.

Concluding remarks

The conclusion of a book is the moment when our role as authors comes to an end at which point we hand the book over to its readers and at which point everything both figuratively and literally is in their hands. It is then very much down to the readers to decide the fate of this piece of work. How the book will 'live on' and what changes it will make to society depends on the responses of its readers. Depending on the way that this book is used, its net life cycle impacts (as analysed in the introduction) will be either beneficial or harmful. In other words, it is up to the reader to use this book to drive sustainable development forward and in doing so offset the negative environmental impacts caused by the production and distribution of the book.

As the title suggests, we have tried to identify the most important challenges facing sustainable development and which need to be addressed in Poland. In each chapter, we have outlined a range of potential options for resolving specific issues, providing examples of how others have used these options in practice. In order to meet the challenges facing sustainable development, we have presented tools and case studies on how to approach these. Readers who wish to further their interests in a specific area can find lists of useful resources along with short summaries that describe them. Each chapter ended by posing a series of questions and we hope that no one interpreted them as a form of test because their purpose was to give the reader a chance to look at his or her own surroundings through a new perspective, having reflected upon the specific topic of the chapter.

As authors, we see the value of that this book has particularly in the various case studies we used. These constituted an accurate snapshot at the end of 2009 of the state of sustainable development in Poland. The analysis of these case studies clearly showed that sustainable development and corporate social responsibility (CSR) are in particular becoming increasingly popular with Polish firms. Polish subsidiaries of Western companies are also implementing similar environmental and social practices as those implemented by their parent companies. What is more is that Polish owned companies are not far behind, where CSR reports are beginning to become common, with new CSR posts being created, responsibilities allocated and initiatives implemented. However, while looking at many examples of Polish CSR activities it is difficult not to wonder if they are only PR gimmicks. This is because many companies lack understanding on the true causes of environmental problems, and the foresight to understand the long-term consequences of their actions. Alongside this, a holistic approach is still needed for their core activities and with it stakeholder engagement which at present is all too often non-existent, although there are of course notable exceptions.

From our analysis of the examples given it is evident that there is a great deal of activity in terms of local development through an increase in self-governance, the number of non-governmental organisations and local community groups. Thus, understanding of sustainability principles is increasing particularly with regards to their developmental role. Funds from the EU are a key driver for many of these initiatives and actions, because EU funding programs require accordance with sustainable development assured through assessment and monitoring. Local partnerships are also being created that focus on the long-term benefits for local communities. However, from the case studies it could be seen that a vast number of projects remain at the pilot stage and so still have a relatively low impact (for the time being).

There are now many sustainability initiatives being implemented within both local government and the business community. However, there is still much more to be done and good practice needs to be encouraged with methods adapted to local circumstances and more training provided for sustainable development specialists. Thus, we hope that this book will enable just this sort of positive change in companies, local communities and the daily lives of ordinary people in Poland but also in other countries.

We would also like to turn our readers' attention to how this book relates to other activities in which the authors have been involved. The idea for this book was born during an international summer academy on the 'Challenges of Sustainable Development in Poland', which has been organised by the Sendzimir Foundation every July since 1998. During the course, in parallel with our other activities, we aim to combine theory with practice. We teach students by engaging them in real-life scenarios where they are involved in collaborating with companies and other institutions presently working in Poland. In this way, our work becomes a platform for collaboration between universities (represented by students and faculty), the private sector, and local authorities in order to exchange information and experience. On the one hand, this enables the dissemination of scientific achievements alongside their applications. On the other hand, it also enables verification of theories and tools by a credible group of people and in real-life situations. The structure of the course and the forms of collaboration we utilise greatly influenced this book. The book is a combination of theory and practice, with the tools and case studies to help implement the principles described and to verify their usefulness across different applications, particularly in business and local government.

Another aspect of the course that is also reflected in this book is the fact that it is interdisciplinary. This characteristic is key for implementing projects that will have lasting positive impacts in aligning with the principles of sustainable development. Unfortunately, within formal education in Poland there are few opportunities for interdisciplinary practice because despite numerous declarations by various universities, narrow specialisations have become more prevalent. This will lead to problems in future as interdisciplinary groups find it challenging to work together or worse still such groups never form because people do not understand the need for them. During our course, we have tried to change this by recruiting students from a variety of different disciplines and group them together. Students are then taught (alongside members of the local and business community) how to work in these groups. This interdisciplinary approach has also been a key part of this book with diverse authors both in terms of their geography and areas of expertise, when writing chapters for this book these multidisciplinary professionals frequently collaborated to create a comprehensive overview. This book, especially through its case studies, aims to highlight the benefits of taking into account economic, social and environmental aspects together, in addition to the problems that arise when holistic approaches are not taken.

Through our educational activities and practices, we have tried to utilise the principles of adaptive management and wide engagement. Moreover, we seek to implement these principles through the use of this book. This requires the involvement of our most important stakeholders, the book's readers. This is why we would like to request feedback from you to make this happen, any criticism, suggestions, requests and proposals that we can receive will enable us to move the project further and to tailor the book to the needs of the rapidly growing number of sustainability professionals in Poland. Thus, your input will be gratefully received.

To further the message of this book and to better embed theory into practice, the book will be supplemented by new editions of the journal *Sustainable Development Applications*. This cyclical publication will focus on sustainable development in businesses and local communities, with its main role to provide up to date case studies and possibly assessments of new trends thus adding to the content of this book. Electronic versions of this book (in both Polish and English) as well as new issues of the above journal will be made available on the Sendzimir Foundation's website <www.sendzimir.org.pl>.

Finally, from the point of view of promoting and developing interdisciplinary collaboration and supporting the group of sustainability professionals there is one more important project that must be mentioned, the social network service <www.challengeSD.eu>. The main aim of this service is to enable planning, initiating and implementation of interdisciplinary projects through participation with students, scientists, business people, local government, communities and NGOs. Its website is also a great source of sustainable development material as well as a place for the publication of new tools and case studies and another important tool that supplements and keeps this book up to date.

Bibliography

Akintoye, A., Beck, M., Hardcastle, C. (eds) (2003), *PPP: managing risks and opportunities*, New York: Blackwell Publishing.

Alexander, C. (1977), *A pattern language: towns, buildings, construction*, New York: Oxford University Press.

Anink, D., Boonstra, C. (1996), *Handbook of sustainable building: an environmental preference method for selection of materials for use in construction and refurbishment*, London: James & James.

Aronsson, T. (2000), 'Social accounting and national welfare measures', in: Folmer, H., Landis Gabel, H. (eds), *Principles of environmental and resource economics*, 2nd edition, Cheltenham, UK & Northampton, MA, US: Edward Elgar, 564–601.

AtKisson, A. (2008), *The ISIS Agreement: how sustainability can improve organizational performance and transform the world*, London: Earthscan.

Ayres, R.U. (1998), 'Rationale for a physical account of economic activities', in: Vellinga, P., Berkhout, F., Gupta, J. (eds), *Managing a material world: perspectives in industrial ecology*, Dordrecht: Kluwer, 1–20.

Ayres, R.U. (2001), 'Industrial ecology: wealth, depreciation and waste', in: Folmer, H., Landis Gabel, H., Gerking, S., Rose, A. (eds), *Frontiers of environmental economics*, Cheltenham, UK & Northampton, MA, US: Edward Elgar, 214–249.

Ayres, R.U., Ayres, L.W. (1998), *Accounting for resources, 1: economy-wide applications of mass-balance principles to materials and waste*, Cheltenham, UK & Lyme, US: Edward Elgar.

Ayres, R.U., Kneese, A.V. (1969), 'Production, consumption, and externalities', *American Economic Review*, **59**(3), 282–297.

Ayres, R.U., Kneese, A.V. (1989), 'Externalities: economics and thermodynamics', in: Archibugi, F., Nijkamp, P. (eds), *Economy and ecology: towards sustainable development*, Dordrecht: Kluwer, 89–118.

Barreteau, O., Bousquet, F., Attonaty, J.M. (2001), 'Role-playing games for opening the black box of multi-agent systems: method and lessons of its application to Senegal River Valley irrigated systems', *Journal of Artificial Societies and Social Simulation*, **4**(2), art. 5.

Barton, H. (ed.) (2002), *Sustainable communities: the potential for eco-neighbourhoods*, London: Earthscan.

Barton, H., Davis, G., Guise, R. (1995), *Sustainable settlements: a guide for planners, designers and developers*, Bristol: Elsevier Science.

Bauman, Z. (2001), *Community: seeking safety in an insecure world,* Cambridge: Polity.

Baumann, H., Tillman, A. (2004), *The hitch hiker's guide to LCA: an orientation in life cycle assessment methodology and application*, Lund: Studentlitteratur.

Beck, U. (2002), *Społeczeństwo ryzyka*, Warsaw: Scholar. German edition: (1986), *Risikogesellschaft*, Frankfurt: Subrkamp.

Begemann, S., Schiechtl, H.M. (1999), *Inżynieria ekologiczna w budownictwie wodnym i ziemnym,* Warsaw: Arkady.

Begg, D., Fischer, S., Dornbusch, R. (2005), *Economics*, 8th edition, New York: McGraw-Hill.

Bergier, T. (2003), 'Mechanizmy usuwania zanieczyszczeń w oczyszczalniach hydrobotanicznych', *Inżynieria Środowiska AGH*, **8**(1), 237–249.

Bergier, T., Czech, A., Czupryński, P. et al. (2004), *Roślinne oczyszczalnie ścieków. Przewodnik dla gmin*, Krakow: Natural Systems.
Bergier, T., Damurski, J., Maliszewska K. (2009), 'Edukacja dla zrównoważonej gospodarki wodnej przez angażowanie studentów w rozwiązywanie rzeczywistych problemów', *Problemy Ekologii*, **XIII**(5), 284–285.
Bergier, T., Włodyka-Bergier, A. (2009), 'Aliphatic hydrocarbons C7–C30 removal from motorway runoff on constructed wetlands', *Polish Journal of Environmental Studies*, **18**(2B), 74–79.
Bertsche, D., Crawford, C., Macadam, S.E. (1996), 'Is simulation better than experience?', *The McKinsey Quarterly*, 1, 50–57.
Blady, W., Netzel, J. (2005), 'Połowy bałtyckiego dorsza w polskim rybołówstwie w latach 1921–2003', *Wiadomości Rybackie*, 143, 12–15.
BME ViKöK (2003), *The building of the scientific bases and background of the tasks serving the improvement of the development of tract, country development, flood decreasing and the high water carrying for phase I of VTT*, Budapest: Budapest University of Technology and Economy.
Bodik, I., Ridderstolpe, P. (2008), *Sustainable sanitation in Central and Eastern Europe: addressing the needs of small and medium size settlements*, Bratislava: Global Water Partnership Central and Eastern Europe.
Bołtromiuk, A., Burger, T. (2008), *Polacy w zwierciadle ekologicznym: raport z badań nad świadomością ekologiczną Polaków w 2008 r.*, Warsaw: Instytut na rzecz Ekorozwoju.
Borys, T. (1998), *Jak budować programy ekorozwoju: informacje ogólne*, Warsaw & Jelenia Góra: Fundacja Karkonoska.
Borys, T. (ed.) (1999), *Wskaźniki ekorozwoju*, Białystok: Wydawnictwo Ekonomia i Środowisko.
Borys, T. (ed.) (2003), *Zarządzanie zrównoważonym rozwojem – Agenda 21 – 10 lat po Rio*, Białystok: Wydawnictwo Ekonomia i Środowisko.
Borys, T. (ed.) (2005), *Wskaźniki zrównoważonego rozwoju*, Białystok & Warsaw: Wydawnictwo Ekonomia i Środowisko.
Borys, T. (2008), *Wskaźniki zrównoważonego rozwoju w ramach Systemu Analiz Samorządowych*, Poznań: Związek Miast Polskich.
Borys, T., Rogala, P. (eds) (2002), *Jak opracować raport środowiskowy? Poradnik dla małych i średnich przedsiębiorstw*, Jelenia Góra: Fundacja Karkonoska.
Borys, T., Rogala, P. (eds) (2008), *Quality of life on local level: an indicators-based study*, Warsaw: UNDP.
BRE Bank (2009), *Passing the test of crisis: sustainable development in difficult times*, Warsaw: BRE Bank.
Brings Jacobsen, N., Anderberg, S. (2004), 'Understanding the evolution of industrial symbiotic networks – the case of Kalundborg', in: van den Bergh, J.C.J.M., Janssen, M.A. (eds), *Economics of industrial ecology: materials, structural change, and spatial scales*, Cambridge, MA: MIT Press, 313–336.
Brown, L.R. (2001), *Eco-economy: building an economy for the Earth*, New York & London: W.W. Norton & Company.
Brownhill, D., Rao, S. (2002), *A sustainability checklist for developments: a common framework for developers and local authorities*, Watford: BRE.
Brzozowska, K. (2005), *Finansowanie inwestycji infrastrukturalnych przez kapitał prywatny na zasadach Project Finance*, Warsaw: CeDeWu.

Buchholz, W. (1997), 'Intergenerational equity', in: Żylicz, T. (ed.), *Ecological economics: markets, prices and budgets in a sustainable society*, Uppsala: Uppsala University, 19–22.

Caldecott, J., Lutz, E. (1996), 'Conclusions', in: *Decentralization and biodiversity conservation*, Washington, D.C.: World Bank.
Cañas, A.J., Carff, R., Hill, G. et al. (2005), 'Concept maps: integrating knowledge and information visualization', in: Tergan, S.-O., Keller, T. (eds), *Knowledge and information visualization*, Heidelberg: Springer, 205–219.
Carpenter, S.R., Pingali, P.L., Bennett, E.M., Zurek, M.B. (eds) (2005), *Ecosystems and human well-being: scenarios*, Washington, D.C.: Island Press.
CBOS (2006), *Zaufanie do rządu, przedsiębiorstw, ONZ i organizacji pozarządowych w 20 krajach świata*, Warsaw: CBOS.
CBOS (2007a), *Stowarzyszeniowo-obywatelski kapitał społeczny*, Warsaw: CBOS.
CBOS (2007b), *Sytuacje z życia Polaków w r. 2007*, Warsaw: CBOS.
CBOS (2008), *Stowarzyszeniowo-obywatelski kapitał społeczny*, Warsaw: CBOS.
CBOS (2009), *Podstawowe fakty o sektorze pozarządowym 2008*, Warsaw: CBOS.
Chamber of Architects (Izba Architektów) (2005), *Kodeks Etyki Zawodowej Architektów*, Załącznik do Uchwały 01 III Sprawozdawczego Krajowego Zjazdu Izby Architektów podjętej 18.06.2005.
Champ, P.A., Boyle, K.J., Brown, T.C. (2004), *A primer on nonmarket valuation*, Dordrecht: Kluwer.
Chappell, T. (1993), *The soul of a business*, New York: Bantam.
Charter, M., Tischner, U. (eds) (2001), *Sustainable solutions: developing products and services for the future*, Sheffield: Greenleaf.
Chichilnisky, G. (1996), 'Sustainable development: an axiomatic approach', *Social Choice and Welfare*, **13**(2), 219–248.
Chopra, K., Leemans, R., Kumar, P., Simons, H. (eds) (2005), *Ecosystems and human well-being: policy responses*, Washington, D.C.: Island Press.
Chryssides, G.D., Kaler, J.H. (1993), *An introduction to business ethics*, Chapham and Hall: Thomson.
City of Los Angeles (2006), *Green roofs – cooling Los Angeles: a resource guide*, Los Angeles, CA: Environmental Affairs Department.
CNCS (Corporation for National & Community Service) (2009), *Volunteering in America research highlights*, <www.volunteeringinamerica.gov>.
Coase, R. (1937), 'The nature of the firm', *Economica*, **4**(16), 386–405.
Combes, C. (1999), *Ekologia i ewolucja pasożytnictwa*, Warsaw: PWN. French edition: (1995), *Interactions durables: écologie et évolution du parasitisme*, Paris: Masson.
Cooper-Marcus, C., Francis, C. (eds) (1998), *People, places: design guidelines for urban open space*, New York: Wiley.
Costanza, R., d'Arge, R., de Groot, R. et al. (1997), 'The value of the world's ecosystem services and natural capital', *Nature*, **387**(6630), 253–260.
Czajkowski, M., Buszko-Briggs, M., Hanley, N. (2009), 'Valuing changes in forest biodiversity', *Ecological Economics*, **68**(12), 2910–2917.
Czapiński, J., Panek, T. (eds) (2006), *Diagnoza społeczna 2005*, Warsaw: Vizja.

Daily, G.C. (1999), 'Developing a scientific basis for managing Earth's life support systems', *Conservation Ecology*, **3**(2), art. 14.

Daly, H.E. (1973), *Toward a steady-state economy*, San Francisco: W.H. Freeman.
Daly, H.E. (1990), 'Sustainable development: from concept and theory to operational principles', in: Davis, K., Bernatam, M.S. (eds), *Resources, environment and population*, New York: Population Council and Oxford University Press, 25–43.
Daly, H.E., Cobb Jr., J.B. (1989), *For the common good: redirecting the economy toward community, the environment and a sustainable future*, Boston: Beacon.
Damurski, J., Bergier, T., Liszka, M. (eds) (2007), *Partycypacyjne planowanie gospodarki ściekowej w Dziewinie*, Wrocław: Centrum Rozwiązań Systemowych.
Danone (2009), *Danone 08 sustainability report*, Paris: Danone.
Dasgupta, P., Mäler, K.-G. (2001), 'Wealth as a criterion for sustainable development', *World Economics*, **2**(3), 19–44.
Davey, A., Clist, S., Godley, A. (2008), *Home composting diversion: household level analysis*, Banbury: Waste and Resources Action Programme.
De Haan, P., Mueller, M.G., Peters, A. (2006), 'Does the hybrid Toyota Prius lead to rebound effects? Analysis of size and number of cars previously owned by Swiss Prius buyers', *Ecological Economics*, **58**(3), 592–605.
DCLG (2006), *Code for sustainable homes: a step-change in sustainable home building practice*, London: Department for Communities and Local Government.
Department of the Environment, Transport and the Regions (1998), *Places, streets and movement*, London: Telford.
Department of the Environment, Transport and the Regions (1999), *By design: urban design in the planning system: a guide to better practice*, London: Telford.
Department of the Environment, Transport and the Regions (2002), *By design: better places to live: companion guide to PPG3*, London: Telford.
DeSimone, L.D., Popoff, F. (2000), *Eco-efficiency: the business link to sustainable development*, Cambridge, MA: MIT Press.
Desrochers, P. (2000), 'Market processes and the closing of "industrial loops": a historical reappraisal', *Journal of Industrial Ecology*, **4**(1), 29–43.
Dębczyński, J. (2001), 'Rola partycypacji społecznej w tworzeniu wieloletnich planów inwestycyjnych przez samorządy', in: Stenka, R., Śmiałkowski, D. (eds), *Wieloletnie plany inwestycyjne*, Warsaw: LGPP, 63–70.
Diamond, J. (1997), *Guns, germs, and steel: the fates of human societies*, New York & London: W.W. Norton & Company.
Diamond, J. (2005), *Collapse: how societies choose to fail or succeed*, New York & London: Viking.
Doniec, A., Reichel, J., Bulińska, M. (2002), 'Assessment of the potential of cleaner production implementation in Polish enterprises', *Journal of Cleaner Production*, **10**(4), 299–304.
Döring, R., Egelkraut, T.M. (2008), 'Investing in natural capital as management strategy in fisheries: the case of the Baltic Sea cod fishery', *Ecological Economics*, **64**(3), 634–642.
Drzazga, D. (2008), *Interaktywny model proekologicznego zarządzania zintegrowaną gospodarką energetyczną i przestrzenną w rozwoju miast*, Łódź: Wydawnictwo Uniwersytetu Łódzkiego.
Duany, A., Plater-Zyberk, E., Speck, J. (2000), *Suburban nation: the rise of sprawl and the decline of the American Dream*, New York: North Point Press.

EC (European Commission) (2004), *Resource book on PPP case studies*, Brussels: Directorate-General Regional Policy.
Edsall, S. (2005), *PPP projects in England, Scotland, Canada and new South Wales: a comparative report*, <www.nswtf.org.au>.
Edvardsson, B., Enquist, B. (2008), *Values-based service for sustainable business. Lessons from IKEA*, London & New York: Routledge.
EEA (2009), *European Community emission inventory report 1990–2007 under the UNECE Convention on Long-range Transboundary Air Pollution (LRTAP)*, Copenhagen: EEA.
Ekins, P. (2003), 'Identifying critical natural capital: conclusions about critical natural capital', *Ecological Economics*, **44**(2–3), 277–292.
Ekins, P., Folke, C., De Groot, R. (2003), 'Identifying critical natural capital', *Ecological Economics*, **44**(2–3), 159–163.
Ekvall, C. (2004), 'The biogas plant in Uppsala: overview of the process, use of gas and waste', *Proceedings of the dissemination workshop on utilization of market wastes*, Kampala, Uganda.
Elgin, D. (2002), 'Voluntary simplicity', in: Hunt Badiner, A. (ed.), *Mindfulness in the marketplace: compassionate responses to consumerism*, Berkley, CA: Parallax Press, 245–259.
English Partnerships, The Housing Corporation (2005), *Urban design compendium*, London: Llewelyn-Davies.
EPA (2002), *Onsite wastewater treatment systems manual*, EPA/625/R-00/008, US EPA.
Esty, D.C., Winston, A.S. (2009), *Green to gold*, Hoboken, NJ: Wiley.
Etnier, C., Guterstam, B. (eds) (1991), *Ecological engineering for wastewater treatment*, Stensund Folk College.
Eurobarometer (2008), *Attitudes of European citizens towards the environment*, Special Eurobarometer 295, Brussels: European Commission.
Eurocommerce (2004), *The use of LCAs on plastic bags in an IPP context*, Brussels: Eurocommerce.
Eurostat (2001), *Economy-wide Material Flow Accounts and derived indicators. A methodological guide*, Luxembourg: Office for Official Publications of the European Communities.
Eurostat (2004), *New decision of Eurostat on deficit and debt treatment of public-private partnerships*, STAT/04/18, Luxembourg: Eurostat Press Office.
Exter, K., Specht, A. (2003), 'Assisting stakeholder decision making using system dynamics group model-building', in: *Extending extension: beyond traditional boundaries, methods and ways of thinking!,* Proceedings of the 2003 APEN National Forum, Hobart.

Faber, M., Manstetten, R., Proops, J.L.R. (1992a), 'Humankind and the environment: an anatomy of surprise and ignorance', *Environmental Values*, **1**(3), 217–241.
Faber, M., Manstetten, R., Proops, J.L.R. (1992b), 'Toward an open future: ignorance, novelty and evolution', in: Costanza, R., Norton, B.G., Haskell, B.D. (eds), *Ecosystem health: new goals for environmental management*, Washington, D.C.: Island Press, 72–96.
FAO (2009), *The state of world fisheries and aquaculture*, Rome: FAO.
Farr, D. (2008), *Sustainable urbanism: urban design with nature*, Hoboken, NJ: Wiley.

Fathy, H. (1976), *Architecture for the poor: an experiment in rural Egypt*, Chicago: University of Chicago Press.
Fiedor, B. (ed.) (2002), *Podstawy ekonomii środowiska i zasobów naturalnych*, Warsaw: C.H. Beck.
Fiksel, J. (ed.) (1996), *Design for environment: creating eco-efficient products and processes*, New York: McGraw-Hill.
FLO (2009), *Annual report 2008–09*, Bonn: Fairtrade Labelling Organizations International.
Florida, R. (2004), *The rise of the creative class: and how it's transforming work, leisure, community and everyday life*, New York: Basic Books.
Florida, R. (2005), *Cities and the creative class*, New York & London: Routledge.
Folmer, H., Gabel, L., Opschoor, H. (eds) (1995), *Principles of environmental and resource economics*, Aldershot: Edward Elgar.
Ford, A. (1999), *Modeling the environment: an introduction to system dynamics modeling of environmental systems*, Washington, D.C.: Island Press.
FPŚ (2008), *Problemy oddziaływania małych i średnich przedsiębiorstw na środowisko*, Krakow: Fundacja Partnerstwo dla Środowiska.
Frey, B., Eichenberg, R. (1996), 'To harmonize or to compete? That's not the question', *Journal of Public Economics*, **60**(3), 335–349.
Frosch, R.A., Gallopoulos, N.E. (1989), 'Strategies for manufacturing', *Scientific American*, **261**(3), 144–152.
FRSI (Fundacja Rozwoju Społeczeństwa Informacyjnego) (2008a), *Biblioteki publiczne: opinie, korzystanie, potrzeby. Badanie mieszkańców terenów wiejskich i małych miast do 20 tys. mieszkańców*, Warsaw: FRSI.
FRSI (2008b), *Biblioteki w Polsce*, Warsaw: FRSI.
Frykowski, M. (2005), *Zaufanie społeczne mieszkańców Łodzi*, Łódź: Wydawnictwo Uniwersytetu Łódzkiego.

Gajewska, M., Obarska-Pempkowiak, H. (2008), 'Constructed wetlands systems for wastewater treatment in Poland', *Architecture Civil Engineering Environment*, **2**(1), 87–95.
Gajewska, M., Obarska-Pempkowiak, H., Arendacz, M. (2008), 'Oczyszczanie wód opadowych w obiektach hydrofitowych', *Gaz, Woda i Technika Sanitarna*, **9**, 56–59.
Galbraith, K. (1977), *The age of uncertainty*, Boston: Houghton Mifflin Company.
Gańczarczyk, T. (2010), 'Domy z prądem i pod prąd', *Nowy Przemysł*, 1.
Gattie, D.K., McCutcheon, S.C., Smith, M.C. (2003), 'Ecological engineering: the state-of-the-field', *Ecological Engineering*, **20**(5), 327–330.
Giergiczny, M. (2009), 'Rekreacyjna wartość Białowieskiego Parku Narodowego', *Ekonomia i Środowisko*, 36, 116–128.
Gil, S., Śleszyński, J. (2003), 'An index of sustainable economic welfare for Poland', *Sustainable Development*, **11**(1), 47–55.
Goodman, J., Laube, M., Schwenk, J. (2005), 'Curitiba's bus system is model for rapid transit', *Race, Poverty & the Environment*, 12/1, 75–76.
Goodwin, P. (2007), 'Effectiveness of transport policies in reducing car travel', in: Gärling, T., Steg, L. (eds), *Threats from car traffic to the quality of urban life*, Amsterdam: Elsevier, 401–424.
Goodwin, P., Hass-Klau, C., Cairn, S. (1998), *Evidence on the effects of road capacity reduction on traffic levels*, <www.worldcarfree.net/resources/freesources/Evide.htm>.

Górecka, M. (2004), *Architektura energooszczędnego domu mieszkalnego polskiej wsi w aspekcie zrównoważonego rozwoju*, Warsaw: Oficyna Wydawnicza Politechniki Warszawskiej
Graczyk, A. (2005), *Ekologiczne koszty zewnętrzne: identyfikacja, szacowanie, internalizacja*, Białystok: Wydawnictwo Ekonomia i Środowisko.
Graedel, T.E. (1994), 'Industrial ecology: definition and implementation', in: Socolow, R.H., Andrews, C.J., Berkhout, F.G., Thomas, V.M. (eds), *Industrial ecology and global change*, Cambridge: Cambridge University Press, 23–42.
Graedel, T.E., Allenby, B.R. (1995), *Industrial ecology*, Englewood Cliffs, NJ: Prentice-Hall.
Granvoetter, M. (1973), 'The strength of weak ties', *American Journal of Sociology*, **78**(6), 1368–1380.
Greszta, M. (2008), 'Oczekiwania społeczne zmieniają zachowania firm w Polsce: Odpowiedzialny Biznes 2008', *Harvard Business Review Polska*, special edition 2008, p. 15.
Greszta, M. (2009), 'Agent zmiany w firmie: Odpowiedzialny Biznes 2009', *Harvard Business Review Polska*, special edition 2009, p. 31.
GRI (2006), *Sustainability reporting guidelines*, version 3, Amsterdam: Global Reporting Initiative.
Grimsey, D., Lewis, M. (2005), 'Are Public Private Partnerships value for money? Evaluating alternative approaches and comparing academic and practitioner views', *Accounting Forum*, **29**(4), 345–378.
Gudelis-Taraszkiewicz, K., Suligowski Z. (2008), 'Alternatywne zagospodarowanie wód opadowych', in: Suligowski Z. (ed.), *Vademecum dla przedsiębiorców*, Wrocław: Partnerstwo „Budujmy Razem", part C.
Gudmundsson, H. (2004), 'Sustainable transport and performance indicators', in: Hester, R.E., Harrison, R.M. (eds), *Transport and the environment*, Cambridge: Royal Society of Chemistry, 35–64.
Guinée, J.B. (ed.) (2002), *Handbook on life cycle assessment: operational guide to the ISO standards*, Dordrecht: Kluwer.
Gumkowska, M., Herbst, J. (2008), *Najważniejsze pytania – podstawowe fakty. Polski sektor pozarządowy 2008*, Warsaw: Stowarzyszenie Klon/Jawor.
GUS (2000), *Mały rocznik statystyczny Polski 2000*, Warsaw: GUS.
GUS (2008), *Ochrona środowiska 2008*, Warsaw: GUS.
GUS (2009a), *Energia ze źródeł odnawialnych w 2008 r.*, Warsaw: GUS.
GUS (2009b), *Mały rocznik statystyczny Polski 2009*, Warsaw: GUS.
GUS (2009c), *Ochrona środowiska 2009*, Warsaw: GUS.

Halme, M., Hrauda, G., Jasch, C. et al. (2004), *Sustainable homeservices: benchmarking sustainable services for the housing sector in the city of tomorrow*, Vienna: IÖW.
Hardin, G. (1968), 'The tragedy of the commons', *Science*, **162** (3859), 1243–1248.
Hartwick, J.M. (1977), 'Intergenerational equity and investing the rents from exhaustible resources', *American Economic Review*, **67**(5), 972–974.
Hassan, R., Scholes, R., Ash, N. (eds) (2005), *Ecosystems and human well-being: current state and trends*, Washington, D.C.: Island Press.
Hausner, J., Marody, M. (eds) (2000), *Jakość rządzenia: Polska bliżej Unii Europejskiej?*, Krakow: MSAP AE & Warsaw: Fundacja im. F. Eberta.

Heidrich, Z., Stańko, G. (2007), *Leksykon przydomowych oczyszczalni ścieków*, Warsaw: Wydawnictwo Seidel-Przywiecki.
Herzog, T. (ed.) (2008), *Charter for solar energy in architecture and urban planning*, Munich: Prestel.
Hicks, J.R. (1939), *Value and capital*, 2nd edition, Oxford: Clarendon Press.
Hillring, B. (2000), *Cofiring of biomass: evaluation of fuel procurement and handling in selected existing plants and exchange of information*, Enköping: ENA Kraft.
Hischier, R., Reichart, I. (2003), 'Multifunctional electronic media – traditional media', *International Journal of Life Cycle Assessment*, **8**(4), 201–208.
Hoeglund, C., Stenstroem, T.A., Joensson, H., Sundin A. (1998), 'Evaluation of faecal contamination and microbial die-off in urine separating sewage systems', *Water Science and Technology,* **38**(6), 17–25.
Hogg, D., Wilson, D., North, J. et al. (2007), *Household waste prevention policy*, Bristol: Eunomia.
Horiuchi, R., Schuchard, R., Shea, L., Townsend, S. (2009), *Understanding and preventing greenwash: a business guide*, London: BSR and Futerra.
Howard, E. (1898), *The three magnets*, przedruk in: Wheeler, S.M., Beatley, T. (eds), *The sustainable urban development reader*, London: Routledge, 150–156.
Huma, M. (2006), *Jak kupować, by nie dać się upolować*, Krakow: PZS.
Huma, M., Krzystkiewicz, M. (2007), *Kupuj odpowiedzialnie! Twoje pieniądze kształtują świat*, Krakow: PZS.

ICES (2009), *ICES advice 2009: book 8*, Copenhagen: ICES.
ICLEI (1997), *Podręcznik ICLEI w zakresie zarządzania ochroną środowiska dla władz samorządowych Europy Środkowej i Wschodniej*, Fryburg: ICLEI.
Idziak, W. (2008), *Wymyślić wieś od nowa*, Koszalin: Alta Press.
IKEA (2008), *IKEA Sustainability Report 2008*, Helsingborg: IKEA.
Imiołczyk, B., Regulski, J. (2007), *Samorządność i demokracja lokalna*, Warsaw: Konwersatorium „Doświadczenie i Przyszłość".
Inglehart, R. (1977), *The silent revolution*, Princeton, NJ: Princeton University Press.
Investment Support (2009), *Partnerstwo publiczno-prywatne krok po kroku*, Warsaw: Investment Support.

Jackson, T. (2005), *Motivating sustainable consumption: a report to the Sustainable Development Research Network*, Guildford: University of Surrey.
Jacobs, J. (1961), *The death and life of great American cities*, New York: Random House.
Janikowski, R. (1999), *Zarządzanie ekologiczne*, Warsaw: Akademicka Oficyna Wydawnicza PLJ.
Janikowski, R. (2004), *Zarządzanie antropopresją*, Warsaw: Difin.
Jeudy, E. (1998), 'Des partenaires–producteurs au Nord de plus en plus nombreux', in: Albert, O. (ed.), *Pour un commerce équitable*, Paris: Éditions Charles Léopold Mayer, 63–66.
Jevons, W.S. (1865), *The coal question: an inquiry concerning the progress of the nation and the probable exhaustion of our coal mines*, London: Macmillan.
Jonzén, N., Cardinale, M., Gårdmark, A., Arrhenius, F., Lundberg, P. (2002), 'Risk of collapse in the eastern Baltic cod fishery', *Marine Ecology Progress Series*, 240, 225–233.

Juchnowicz, S. (2005), *Nowa Huta: przeszłość i wizja – z doświadczeń warsztatu projektowego*, in: Salwiński, J., Sibila, L.J. (eds), *Nowa Huta: przeszłość i wizja. Studium muzeum rozproszonego*, Krakow: Biblioteka Krzysztoforska.

Kaca, E. (2007), 'Infrastruktura wodno-ściekowa na wsi na przełomie wieków', *Problemy Inżynierii Rolniczej*, **1**, 35–45.

Kahn, M.E., Vaughn, R.K. (2009), 'Green market geography: the spatial clustering of hybrid vehicles and LEED registered buildings', *The B.E. Journal of Economic Analysis & Policy*, **9**(2), art. 2.

Kalinka, P. (2003), *Wycena walorów turystycznych Puszczy Białowieskiej w kontekście sporu o powiększenie Białowieskiego Parku Narodowego*, MA thesis, Warsaw: University of Warsaw.

Kalisz, L., Sałbut, J. (2007), 'Dewatering of anaerobically stabilized sludge on reed beds', *Ochrona Środowiska i Zasobów Naturalnych*, **30**, 105–115.

Kanatschnig, D., Resel, K., Strigl, A. (2003), *Guidelines: reporting about sustainability. 7 steps to a successful sustainability report*, Vienna: Bundesministerium für Verkehr, Innovation und Technologie.

Kangas, P.C. (2004), *Ecological engineering: principles and practice*, Boca Raton, FL: CRC Press.

Karnicki, Z., Horbowy, J., Radtke, K. (2008), 'Dorsz bałtycki: co nas naukowców niepokoi?', *Wiadomości Rybackie*, 161, 3–8.

Kent County Council (2000), *Kent design: a guide to sustainable development*, Canterbury: KCC.

Kibert, C.J. (1994), 'Principles and a model for sustainable construction', in: *Proceedings of the First International Conference on Sustainable Construction*, 6–9.11.1994, Tampa, FL, 1–9.

Kirkham, D. (2002), 'Light rail cities: what Perth can learn' in: *Sustainable cities practicum and field trip to Europe semester 2-2002*, Perth: Murdoch University, 3-1–3-27.

Klein, N. (2000), *No logo*, Toronto: Knopf.

Kobus, D. (2002), *The evaluation of progress towards achieving sustainable development in countries in transition*, Ph.D. thesis, Manchester: University of Manchester.

Kołakowski, M.M. (2005), 'Rewolucja z beczki Diogenesa', *Architektura i Biznes*, 6, 34–43.

Konopska, B. (ed.) (2007), *Łódź 1:22 500. Plan Miasta*, Warsaw: PPWK.

Kopańska, A., Bartczak, A., Siwińska-Gorzelak, J. (2008), *Partnerstwo publiczno-prywatne: podmioty prywatne w realizacji zadań publicznych sektora wodno-kanalizacyjnego*, Warsaw: CeDeWu.

Kosiński, W. (1995), 'Kształtowanie krajobrazu kulturowego: miasteczko turystyczne na przykładzie Janowca n/Wisłą', *Ochrona Zabytków*, 3–4, 266–282.

Kowalski, Z., Kulczycka, J., Góralczyk, M. (2007), *Ekologiczna ocena cyklu życia procesów wytwórczych*, Warsaw: PWN.

Krier, L. (2001), *Architektura: wybór czy przeznaczenie*, Warsaw: Arkady.

Kronenberg, J. (2007a), *Ecological economics and industrial ecology: a case study of the Integrated Product Policy of the European Union*, London & New York: Routledge.

Kronenberg, J. (2007b), 'Making consumption "reasonable"', *Journal of Cleaner Production*, **15**(6), 557–566.

Kronenberg, J. (2008), 'Rynek produktów sprawiedliwego handlu (fair trade) w Polsce', *Acta Universitatis Lodziensis – Folia Oeconomica*, 221, 127–138.

Kronenberg, J., Clift, R. (2004), 'Industrial ecology in Poland', *Journal of Industrial Ecology*, **8**(4), 13–17.
Kronenberg, J., Winkler, R. (2009), 'Wasted waste: an evolutionary perspective on industrial by-products', *Ecological Economics*, **68**(12), 3026–3033.
Królikowska, K., Kronenberg, J., Maliszewska, K. et al. (2007), 'Role-Playing Simulation as a communication tool in community dialogue: Karkonosze Mountains case study', *Simulation and Gaming*, **38**(2), 195–210.
Kuikka, S., Hildén, M., Gislason, H. et al. (1999), 'Modeling environmentally driven uncertainties in Baltic cod (Gadus morhua) management by Bayesian influence diagrams', *Canadian Journal of Fisheries and Aquatic Sciences*, **56**(4), 629–641.
Kukla, P., Wojtulewicz, J. (2009), *Analiza potencjału zmniejszenia zużycia energii w nowych budynkach w wyniku zastosowania wyższych standardów w zakresie izolacyjności przegród zewnętrznych*, Warsaw & Katowice: WWF Polska and Fundacja na rzecz Efektywnego Wykorzystania Energii.
Kurczewski, P., Lewandowska, A. (2008), *Zasady prośrodowiskowego projektowania obiektów technicznych dla potrzeb zarządzania ich cyklem życia*, Poznań: KMB Druk.
Kurowski, M., Rudnicki, A. (2006), 'Koncepcje rozwoju sieci tramwajowej w Krakowie', *Konferencja Naukowo-Techniczna Miasto i Transport 2006*, Warsaw: Koło Naukowe Inżynierii Komunikacyjnej.
Kvarnström, E., Emilsson, K., Richert Stintzing, A. et al. (2006), *Urine diversion: one step towards sustainable sanitation*, Stockholm: Stockholm Environment Institute.
Kwiatkowski, J. (2003), *Partycypacja społeczna i rozwój społeczny*, Warsaw: Fundacja Rozwoju Demokracji Lokalnej.

Lantz, M., Svensson, M., Björnsson, L., Börjesson, P. (2007), 'The prospects for an expansion of biogas systems in Sweden: incentives, barriers and potentials', *Energy Policy*, **35**(3), 1830–1843.
Laszlo, C. (2003), *The sustainable company*, Washington, D.C.: Island Press.
Lehtonen, M. (2004), 'The environmental–social interface of sustainable development: capabilities, social capital, institutions', *Ecological Economics*, **49**(2), 199–214.
Lenartowicz, J.K. (2004), *Słownik psychologii architektury*, Krakow: Wydawnictwo Politechniki Krakowskiej.
Lenartsson, M., Ridderstolpe, P. (2001), *Guidelines for using urine and blackwater diversion systems in single-family homes*, Uppsala: Coalition Clean Baltic.
Liro, A. (1995), *Koncepcja krajowej sieci ekologicznej ECONET – Polska*, Warsaw: Fundacja IUCN Poland.
Loga, T., Knissel, J., Diefenbach, N. (2008), *Energy performance requirements for new buildings in 11 countries from Central Europe*, Darmstadt: Institut Wohnen und Umwelt.
Lokalna akcja na rzecz środowiska, czyli jak własnymi siłami opracować program ochrony środowiska dla gminy lub powiatu (2000), Warsaw: NFOŚiGW.
Low, N. (2007), 'The green city: sustainable homes, sustainable suburbs', in: Thvaites, K., Porta, S., Romice, R., Greaves, M. (eds), *Urban sustainability through environmental design*, London: Routledge, 133–165.

Macias, A., Mizgajski, A. (1998), 'Metabolizm Poznania w kategoriach ekologii miasta', in: Domański, R. (ed.), 'Podstawy gospodarczej polityki miasta. Studium Poznania', *Biuletyn KPZK PAN*, 181, 103–116.

Magnuszewska, J. (ed.) (2003), *Dynamika zrównoważonego rozwoju. Region Karkonoszy i Dolina Odry*, Wrocław: Stowarzyszenie Zielona Kultura.
Magnuszewski, P., Sendzimir, J., Kronenberg, J. (2005), 'Conceptual modeling for adaptive environmental assessment and management in the Barycz Valley, Lower Silesia, Poland', *International Journal of Environmental Research and Public Health*, **2**(2), 194–203.
Maibach, M., Schreyer, C., Sutter, D. et al. (2008), *Handbook on estimation of external costs in the transport sector*, Delft: CE Delft.
Markowski, T., Gzell, S., Kochanowski, M. et al. (2009), *Polityka miejska państwa: cele, priorytety, instrumenty*, Warsaw: Ministerstwo Infrastruktury.
Mas-Colell, A., Whinston, M.D., Green, J.R. (1995), *Microeconomic theory*, Oxford: Oxford University Press.
Mazurkiewicz, P. (2006), *CSR implementation guide: non-legislative options for the Polish government*, Washington, D.C. & Warsaw: The World Bank.
McCormick, K., Kåberger, T. (2005), 'Exploring a pioneering bioenergy system: the case of Enköping in Sweden', *Journal of Cleaner Production*, **13**(10–11), 1003–1014.
McHarg, I.L. (1969), *Plight and prospect*, reprinted in: Wheeler, S.M., Beatley, T. (eds), *The sustainable urban development reader*, London: Routledge, 34–37.
Meadows, D.H. (1989), 'System dynamics meets the press', *System Dynamics Review*, **5**(1), 69–80.
Meadows, D.H. (1998), *Indicators and information systems for sustainable development: a report to the Balaton Group*, Hartland VT: Sustainability Institute.
Mendler, S.F., Odel, W. (2000), *The HOK guidebook to sustainable design*, New York: Wiley.
Mentzer, J.T., DeWitt, W., Keebler, J.S. et al. (2001), 'Defining supply chain management', *Journal of Business Logistics*, **22**(2), 1–25.
Miara, M. (2010), 'Pompy ciepła', *Murator*, 2, 152–158.
Miejska Pracownia Urbanistyczna (2009), *Projekt studium uwarunkowań i kierunków zagospodarowania przestrzennego miasta Łodzi,* Łódź: MPU.
Ministerstwo Gospodarki (2009), *Polityka energetyczna Polski do 2030 roku*, draft of 5th March 2009.
Miszalska, A., Piotrowski, A. (eds) (2006), *Obszary ładu i anomii. Konsekwencje i kierunki polskich przemian*, Łódź: Wydawnictwo Uniwersytetu Łódzkiego.
Mitsch, W.J. (2003), 'Ecology, ecological engineering, and the Odum brothers', *Ecological Engineering*, **20**(5), 331–338.
Mitsch, W.J., Jørgensen, S.E. (2003), 'Ecological engineering: a field whose time has come', *Ecological Engineering*, **20**(5), 363–377.
Mitsch, W.J., Lefeuvre, J.C., Bouchard V. (2002), 'Ecological engineering applied to river and wetland restoration', *Ecological Engineering*, **18**(5), 529–541.
Mizgajski, A. (2000), 'Cechy ekologicznie podtrzymywalnego rozwoju Poznania w świetle form metabolizmu miasta i struktury przestrzennej', *Biuletyn KPZK PAN*, 192, 221–244.
Moberg, Å., Johansson, M., Finnveden, G., Jonsson, A. (2007), *Screening environmental life cycle assessment of printed, web based and tablet e-paper newspaper*, Stockholm: Royal Institute of Technology (KTH).
Moldan, B., Billharz, S. (1997), *Sustainability indicators*, Chichester, UK: Wiley.
Molnar, G. (2005), *A Tiszanal. Ekvilibrium kiadó*, Budapest.
Mols, C.M.M., Visser, M.E. (2002), 'Great tits can reduce caterpillar damage in apple orchards', *Journal of Applied Ecology*, **39**(6), 888–899.

Mont, O., Plepys, A. (2004), 'What is behind meagre attempts to sustainable consumption? Institutional and product-service system perspective', in: Hubacek, K., Inaba, A., Stagl, S. (eds), *Proceedings of the International Workshop on Driving Forces of and Barriers to Sustainable Consumption*, Leeds: University of Leeds, 108–126.

Møller, B., Thøgersen, J. (2008), 'Car use habits: an obstacle to the use of public transportation?', in: Jensen-Butler, C., Sloth, B., Larsen, M.M., Madsen, B., Nielsen, O.A. (eds), *Road pricing: the economy and the environment*, Berlin & Heidelberg: Springer, 301–314.

Mündl, A., Schütz, H., Stodulski, W., Śleszyński, J., Welfens, M.J. (1999), *Ekorozwój poprzez odmaterializowanie produkcji i konsumpcji*, Warsaw: Instytut na rzecz Ekorozwoju.

Mycielski, M., Choynowski, P., Buczek, G. (2005), 'Karta Nowej Urbanistyki', *Urbanista*, 6, 8–10.

NAO (National Audit Office) (2005), *Darent Valley Hospital: the PFI contract in action*, London: NAO.

Newman, P. (2007), 'Travel time budgets as a tool for sustainable urban design' in: Thvaites, K., Porta, S., Romice, R., Greaves, M. (eds), *Urban sustainability through environmental design*, London: Routledge, 87–94.

Novak, J.D., Cañas, A.J. (2006a), 'The origins of the concept mapping tool and the continuing evolution of the tool star', *Information Visualization*, **5**(3), 175–184.

Novak, J.D., Cañas, A.J. (2006b), *The theory underlying concept maps and how to construct them*, Pensacola, FL: Florida Institute for Human and Machine Cognition.

Nuij, R. (2001), 'Eco-innovation: helped or hindered by Integrated Product Policy', *Journal of Sustainable Product Design*, **1**(1), 49–51.

Obarska-Pempkowiak, H. (2002), *Oczyszczalnie hydrofitowe*, Gdańsk: Wydawnictwo Politechniki Gdańskiej.

Obarska-Pempkowiak, H., Gajewska, M., Wojciechowska E., Ostojski A. (2009), 'Koncepcja rozwiązania problemu przydomowej gospodarki ściekowo-osadowej', *Gaz, Woda i Technika Sanitarna*, **7–8**, 6–10.

Obarska-Pempkowiak, H., Kołecka K., (2006), 'Experiences with utilisation of sewage sludge in reed beds', *Rocznik Ochrony Środowiska. Środkowo-Pomorskie Towarzystwo Naukowe*, **8**, 65–78**.**

Obarska-Pempkowiak, H., Tuszyńska, A. (2008), 'Perspektywy rozwoju w Europie systemów sanitarnych z zastosowaniem toalet separujących', *Gaz, Woda i Technika Sanitarna*, **7–8**, 42–49.

Odum, H.T., Odum, B. (2003), 'Concepts and methods of ecological engineering', *Ecological Engineering*, **20**(5), 339–361.

OECD (2003), *External costs of transport in Central and Eastern Europe*, Paris: OECD.

OECD (2005), *Why fish piracy persists: the economics of illegal, unreported and unregulated fishing*, Paris: OECD.

Olsson, P., Gunderson, L.H., Carpenter, S.R., Ryan, P., Lebel, L., Folke, C., Holling, C.S. (2006), 'Shooting the rapids: navigating transitions to adaptive governance of social-ecological systems', *Ecology and Society*, **11**(1), art. 18.

Oosterhuis, F., Rubik, F., Scholl, G. (1996), *Product policy in Europe: new environmental perspectives*, Dordrecht: Kluwer.

Opschoor, J.B. (1996), 'Institutional change and development towards sustainability', in: Costanza, R., Segura, O., Martinez-Alier, J. (eds), *Getting down to Earth: practical applications of ecological economics*, Washington, D.C.: Island Press, 327–350.

Page, T. (1977), *Conservation and economic efficiency: an approach to materials policy*, Baltimore: Johns Hopkins.
PAIiZ, Investment Support (2009), *Public-Private Partnership in Poland*, Warsaw: PAIiZ.
Pańków, W., Gąciarz, B. (2001), *Dialog społeczny w Polsce w okresie adaptacji polskiej gospodarki do wymogów Unii Europejskiej*, Warsaw: Fundacja F. Eberta.
Parfitt, J. (2009), *Home composting diversion: district level analysis*, Banbury: Waste and Resources Action Programme.
Pawłowska, K. (2008), *Przeciwdziałanie konfliktom wokół ochrony i kształtowania krajobrazu*, Krakow: Wydawnictwo Politechniki Krakowskiej.
PBIKiC (Pracownia Bibliotekoznawstwa Instytutu Książki i Czytelnictwa) (2000), *Biblioteki publiczne w liczbach 1999*, Warsaw: Biblioteka Narodowa.
PBIKiC (2008), *Biblioteki publiczne w liczbach 2007*, Warsaw: Biblioteka Narodowa.
PBIKiC (2009), *Biblioteki publiczne w liczbach 2008*, Warsaw: Biblioteka Narodowa.
Pearce, D. (1987), 'Foundations of an ecological economics', *Ecological Modelling*, **38**(1–2), 9–18.
Pearce, D.W., Pearce, C.G.T. (2001), *The value of forest ecosystems*, Montreal: Secretariat of the Convention on Biological Diversity.
Peattie, K., Shaw, B. (2006), *Consumption: reducing, reusing and recycling*, Swindon: Economic and Social Research Council.
Peryt, A. (1956), *Wykorzystajmy każdy skrawek surowca*, Warsaw: Biuro Wydawnictw Centralnego Związku Spółdzielczości Pracy.
Petersens, E. (2001), *Market survey: extremely low flush toilets*, Uppsala: SwedEnviro and Water Revival Systems.
Pezzey, J. (1989), *Economic analysis of sustainable growth and sustainable development*, Environment Department Working Paper No. 15, Washington, D.C.: The World Bank.
PGNiG (2009), *Responsible energy: CSR report 2008*, Warsaw: PGNiG.
Piplani, R., Pujawan, N., Ray, S. (2008), 'Sustainable supply chain management', *International Journal of Production Economics*, **111**(2), 193–194.
Pirveli, M., Rykiel, Z. (2007), 'Enklawy i eksklawy społeczne późnej nowoczesności', in: Gołdyna, L., Machaj, I. (eds), *Enklawy życia społecznego*, Szczecin: Wydawnictwo Naukowe Uniwersytetu Szczecińskiego, 95–112.
Pohle, G., Hittner, J. (2008), *Attaining sustainable growth through corporate social responsibility*, Somers, NY: IBM Institute for Business Value.
Porta, S., Latora, V. (2007), 'Multiple centrality assessment: mapping centrality in networks of urban spaces', in: Thvaites, K., Porta, S., Romice, R., Greaves, M. (eds), *Urban sustainability through environmental design*, London: Routledge, 101–105.
Porter, M.E. (1991), 'America's green strategy', *Scientific American*, **264**(4), 168.
Porter, M.E., Kramer, M.R. (2006), 'Strategy and society', *Harvard Business Review*, **85**(12), 78–92.
Porter, M.E., van der Linde, C. (1995a), 'Green and competitive', *Harvard Business Review*, **73**(5), 120–134.
Porter, M.E., van der Linde, C. (1995b), 'Toward a new conception of the environment–competitiveness relationship', *Journal of Economic Perspectives*, **9**(4), 97–118.

PPS and FPŚ (Project for Public Spaces and Fundacja Partnerstwo dla Środowiska) (2009), *Jak przetworzyć miejsce. Podręcznik kreowania udanych przestrzeni publicznych*, Krakow: FPŚ.
Prahalad, C.K. (2006), *The fortune at the Bottom of the Pyramid: eradicating poverty through profits*, Philadelphia: Wharton School Publishing.
Preisner, L., Pindór, T. (2000), *Przeglądy efektywności przemysłu i ochrony środowiska*, 3rd edition, Krakow: Wydawnictwa AGH.
Proekologiczna gospodarka odpadami w gminie (2000), 2nd edition, Oświęcim & Krakow: Towarzystwo na rzecz Ziemi.
Putnam, R. (2000), *Bowling alone: the collapse and revival of American community*, New York: Simon & Schuster.

Quariguasi Frota Neto, J., Bloemhof-Ruwaard, J.M., van Nunen, J.A.E.E., van Heck, E. (2008), 'Designing and evaluating sustainable logistics networks', *International Journal of Production Economics*, **111**(2), 195–208.

Rawls, J. (1971), *A theory of justice*, Cambridge, MA: Harvard University Press.
Reichart, I., Hischier, R. (2001), *Vergleich der Umweltbelastungen bei Benutzung elektronischer und gedruckter Medien*, St. Gallen: ugra/EMPA.
Reichart, I., Hischier, R. (2002), 'The environmental impact of getting the news', *Journal of Industrial Ecology*, **6**(3–4), 185–200.
Repenning, N. (2002), 'A simulation based approach to understanding the dynamics of innovation implementation', *Organization Science*, **13**(2), 109–127.
Ridderstolpe, P. (2001), *Oczyszczanie ścieków w małych miejscowościach: warianty modernizacji*, Uppsala: Water Revival Systems.
Rittel, H.W.J., Webber, M.M. (1973), 'Dilemmas in a general theory of planning', *Policy Sciences*, **4**(2), 155–169.
Rogala, P. (2003), 'Audyt lokalny jako nowy instrument zarządzania zrównoważonym rozwojem', in: Borys, T. (ed.), *Zarządzanie zrównoważonym rozwojem – Agenda 21 – 10 lat po Rio*, Białystok: Wydawnictwo Ekonomia i Środowisko, 274–279.
Rogers, R., Power, A. (2000), *Cities for a small country*, London: Faber and Faber.
Rouba, H. (1999), 'Zastosowanie strategii czystszej produkcji w zarządzaniu środowiskowym w przedsiębiorstwie', in: Miłaszewski, R. (ed.), *Strategia zarządzania środowiskowego w przedsiębiorstwie i gminie*, Poznań: Polskie Zrzeszenie Inżynierów i Techników Sanitarnych, 116–132.
Rudnicki, A. (ed.) (2004), *Zintegrowany plan rozwoju transportu publicznego dla Krakowa (dokument roboczy)*, Krakow: Wydawnictwo Politechniki Krakowskiej.
Rudnicki, A., Kollbek, A. (2007), 'Strefy ruchu uspokojonego i pieszego w śródmieściu Krakowa', *Konferencja Naukowo-Techniczna Miasto i Transport 2007*, Warsaw: Koło Naukowe Inżynierii Komunikacyjnej.
Rudnicki, A., Kopta, T., Zalewski, A. (2005), 'Obsługa komunikacyjna rewitalizowanego obszaru centralnego Łodzi', Łódź: Prorevita.
Rydén, L. (2003), 'Enköping Water Management', *Baltic University Urban Forum Report*, **20**.
Ryńska, E.D. (2004), *Architekt w procesie tworzenia harmonijnego środowiska*, Warsaw: Oficyna Wydawnicza Politechniki Warszawskiej.

Samuelson, P.A., Nordhaus, W.D. (1998), *Economics*, 16th edition, New York: McGraw-Hill.
Santala, E., Kaloinen, J. (2004), 'New regulation enhances improvement of onsite wastewater treatment in Finland', *Small Water and Wastewater Systems,* 6th Specialist Conference, Fremantle, Australia.
Scharmer, C.O. (2007), *Theory U: leading from the future as it emerges*, Cambridge, MA: Society for Organisational Learning.
Schneider, B. (2007), *Koncepcja rozwoju regionalnego w oparciu o gospodarcze wykorzystanie wód geotermalnych: Termy Warmińskie*, Lidzbark Warmiński: Starostwo Powiatowe.
Schreyer, C., Schneider, C., Maibach, M. et al. (2004), *External costs of transport*, Zurich: INFRAS.
Sendzimir, J., Balogh, P., Vari, A., Lantos, T. (2004). 'The Tisza River Basin: slow change leads to sudden crisis', in: Light, S. (ed.), *The role of biodiversity conservation in the transition to rural sustainability*, Amsterdam: ISO Press, 261–290.
Sendzimir, J., Flachner Z. (2007), 'Exploiting ecological disturbance', in: McNeely, J., Scherr, S. (eds), *Farming with nature: the science and practice of ecoagriculture*, Washington, D.C.: Island Press, 213–230.
Sendzimir, J., Magnuszewski, P., Balogh, P., Vari, A. (2007), 'Anticipatory modeling of biocomplexity in the Tisza river basin: first steps to establish a participatory adaptive framework', *Environmental Modelling and Software*, **22**(5), 599–609.
Sendzimir, J., Magnuszewski, P., Flachner, Z. et al. (2008), 'Assessing the resilience of a river management regime: informal learning in a shadow network in the Tisza River Basin', *Ecology and Society*, **13**(1), art. 11.
Senge, P.M. (1990), *The fifth discipline*, New York: Doubleday.
Sennet, R. (1998), *The corrosion of character: the personal consequences of work in the New Capitalism*, New York: W.W. Norton & Company.
SEPA (2009), *Wastewater treatment in Sweden,* Stockholm: Swedish Environmental Protection Agency.
Shechter, M. (2000), 'Valuing the environment', in: Folmer, H., Landis Gabel, H. (eds) *Principles of environmental and resource economics*, 2nd edition, Aldershot: Edward Elgar, 72–103.
Shirley, M., Walsh P. (2000), *Public versus private ownership: the current state of the debate*, Washington, D.C.: World Bank.
Siebenhandl, B. (2007), 'Disposal safety in Vienna', *Safe and clean: safety of disposal and clean city*, 8th International Conference on Waste Management, Vienna.
Siposs, V., Kiss, F. (2002), *Living with the river*, LIFE-nature project in the Tisza Floodplain, Budapest: WWF.
Siuta, J., Wasiak, G. (2000), *Kompostowanie odpadów i użytkowanie kompostu*, Warsaw: Instytut Ochrony Środowiska.
Slessor, C. (1997), *Sustainable architecture and high technology*, London: Thames & Hudson.
Słyś, D. (2006), 'Wykorzystanie wód opadowych w instalacji sanitarnej budynków mieszkalnych', *Przegląd Naukowy Inżynieria i Kształtowanie Środowiska*, **33**(1), 192–201.
Smith, N.C., Lenssen, G. (2009), *Mainstreaming corporate responsibility*, Chichester, UK: Wiley.
Smits, A.J.M., Nienhuis, P.H., Leuven, R.S.E.W. (2000), *New approaches to river management*, Leiden: Backhuys Publishers.

Sony (2002), *Sony Europe press statement on temporary halt of shipments of some Sony models in Europe*, Cologne: Sony Europe GmbH.
Sorrell, S. (2007), *The rebound effect: an assessment of the evidence for economy-wide energy savings from improved energy efficiency*, London: UKERC.
SPN (2007), *Guide to the business case and benefits of sustainability purchasing*, Vancouver: Sustainability Purchasing Network.
Stachowiak, M. (2001), *Ekologiczny odcisk stopy jako wskaźnik trwałego rozwoju Polski*, MA thesis, Warsaw: Uniwersytet Warszawski.
Stave, K.A. (2003), 'A system dynamics model to facilitate public understanding of water management options in Las Vegas, Nevada', *Journal of Environmental Management*, **67**(4), 303–313.
Sterman, J.D. (2000), *Business dynamics: system thinking and modeling for a complex world,* Boston: Irwin/McGraw-Hill.
Stoczkiewicz, M. (2003), *Prawa konsumentów w kontekście ochrony środowiska*, Krakow: PZS.
Strigl, A., Bosch, G., Reisinger, H. (2007), *Sustainability Management System: Kennzahlenbasierter Aufbau eines betrieblichen Nachhaltigkeitsmanagements*, Wien: Bundesministerium für Verkehr, Innovatiion und Technologie.
Suligowski, Z., Tuszyńska, A. (2008), 'Alternatywna kanalizacja', in: Suligowski, Z. (ed.), *Vademecum dla przedsiębiorców*, Wrocław: Partnerstwo „Budujmy Razem", part B.
Symon, E. (2009), *Wypadki drogowe w Polsce w 2008 roku*, Warsaw: Komenda Główna Policji.
Szczepanowska, H.B. (2001), *Drzewa w mieście*, Warsaw: Hortpress.
Szczepanowska, H.B. (2008), *Wycena wartości drzew na terenach zurbanizowanych*, Warsaw: Instytut Gospodarki Przestrzennej i Mieszkalnictwa.
Szlávik, L. (2003), 'Az elmúlt másfél évszázad jelentísebb Tisza-völgyi árvizei és az árvízvédelem szakaszos fejlesztése', *Vízügyi Közlemények Különszám* IV.
Sztompka, P. (2007), *Zaufanie: fundament społeczeństwa*, Krakow: Znak.
Szulczewska, B., Cieszewska, A., (2006), 'Układ przyrodniczy obszaru metropolitalnego: sieć w pierścieniu czy pierścień w sieci?', in: Kozłowski, S. (ed.), *Żywiołowe rozprzestrzenianie się miast: studia nad zrównoważonym rozwojem*, volume 2, Białystok & Warsaw: Wydawnictwo Ekonomia i Środowisko, 49–70.
Szymański, Ł., Włodarek, P. (2006), 'Modernizacja tramwaju na Trasie W–Z: priorytet dla tramwajów na Moście Śląsko-Dąbrowskim w badaniach symulacyjnych', *Konferencja Naukowo-Techniczna Miasto i Transport 2006*, Warsaw: Koło Naukowe Inżynierii Komunikacyjnej.

Taff, S.J. (1998), *AgLand: the game. Simulating real-life decisions and consequences*, University of Minnesota <www.extension.umn.edu/AgLand>.
Theiss, M. (2007), *Krewni – znajomi – obywatele: kapitał społeczny a lokalna polityka społeczna*, Toruń: Adam Marszałek.
Tischner, U., Charter, M. (2001), 'Sustainable product design', in: Charter, M., Tischner, U. (eds), *Sustainable solutions: developing products and services for the future*, Sheffield: Greenleaf, 118–138.
Tukker, A., Jansen, B. (2006), 'Environmental impacts of products: a detailed review of studies', *Journal of Industrial Ecology*, **10**(3), 159–182.
Tukker, A., Tischner, U. (eds) (2006), *New business for Old Europe*, Sheffield: Greenleaf.

UNDP (2002), *Audit zrównoważonego rozwoju gmin i powiatów: oferta pomocy doradczej*, Warsaw: UNDP.
UNDP (2003), *Polskie społeczeństwo na drodze do zrównoważonego rozwoju (Poland towards sustainable human development)*, Warsaw: UNDP.
UNDP (2008), *World Development Report 2007/2008*, New York: UNDP.
UNEP (2004), *Freshwater in Europe*, Châtelaine: UNEP/DEWA Europe.
Urban Design Group (2002), *Urban design guidance*, London: Telford.
UZP (Urząd Zamówień Publicznych) (2009), *Zielone zamówienia publiczne*, Warsaw: UZP.

Vaillancourt-Rosenau, P. (ed.) (2002), *Public-private policy partnership*, Cambridge, MA: MIT Press.
van den Belt, M., Wenger, R., Harris, B. (2004), 'Decision support for watershed management in the Upper Fox River Basin, Wisconsin, USA', in: van den Belt, M. (ed.), *Mediated modeling: a system dynamics approach to environmental consensus building*, Washington, DC: Island Press, 99–136.
van Hoek, R.I. (1999), 'From reversed logistics to green supply chains', *Supply Chain Management: An International Journal*, **4**(3), 129–135.
van Tulder, R., van der Zwart, A. (2006), *International business–society management*, London & New York: Routledge.
Vattenfall (2008), *CSR report 2007*, Stockholm: Vattenfall.
Vennix, J., (1996), *Group model building: facilitating team learning using system dynamics*, New York: Wiley.
Verhoef, E.T., Robin Lindsey, C., Niskanen, E. et al. (2008), 'Implementation paths for marginal cost-based pricing in urban transport: Theoretical considerations and case studies results', in: Jensen-Butler, C., Sloth, B., Larsen, M.M., Madsen, B., Nielsen, O.A. (eds), *Road pricing: the economy and the environment*, Berlin & Heidelberg: Springer, 49–78.
Vitruvius (1999), *O architekturze ksiąg dziesięć*, Warsaw: Prószyński i S-ka.
von Weizsäcker, E., Lovins, A.B., Hunter Lovins, L. (1998), *Factor four: doubling wealth, halving resource use*, London: Earthscan.
Vymazal, J. (2005), 'Horizontal sub-surface flow and hybrid constructed wetlands systems for wastewater treatment', *Ecological Engineering*, **25**(5), 478–490.

Wackernagel, M., Rees, W. (1996), *Our ecological footprint: reducing human impact on the Earth*, Gabriola Island, BC: New Society Publishers.
WCED (World Commission on Environment and Development) (1987), *Our common future*, Oxford: Oxford University Press.
Wesołowski, J. (2003), *Transport miejski: ewolucja i problemy współczesne*, Łódź: Wydawnictwo Politechniki Łódzkiej.
Wesołowski, J. (2008), *Miasto w ruchu: przewodnik po dobrych praktykach w organizowaniu transportu miejskiego*, Łódź: Instytut Spraw Obywatelskich.
Wheeler, S.M. (2004), *Planning for sustainability: creating livable, equitable, and ecological communities*, London & New York: Routledge.
Whiston-Sprin, A. (1984), *The granite garden: urban nature and human design*, New York: Basic Books.
WHO (1983), *Indoor air pollutants: exposure and health effect*, EURO Reports and Studies 78, Genewa: WHO.
Wierzbowska, T., Kuraszko, I. (2006), *Odpowiedzialny biznes w Polsce: dobre praktyki, 2006,* Warsaw: Forum Odpowiedzialnego Biznesu.

Wojtulewicz, J., Osicki, A. (2006), *Oszacowanie potencjału zmniejszenia zużycia energii elektrycznej w gospodarstwach domowych w Polsce*, Katowice: Fundacja na rzecz Efektywnego Wykorzystania Energii.
Wójcik, A. (2007), *Jak powstawała oczyszczalnia roślinna w Dziewinie*, documentary film, Krakow: Centrum Rozwiązań Systemowych.

Xerox (2008), *2007 Report on global citizenship*, Norwalk, CT: Xerox.

Zalewski, D. (ed.) (2005), *Dialog społeczny na poziomie regionalnym: ocena szans rozwoju*, Warsaw: IPiSS.
Zalewski, M., Wagner, I. (2005), 'Ecohydrology: the use of water and ecosystem processes for healthy urban environments', *Ecohydrology and Hydrobiology*, **5**(4), 263–268.
Zgoła, B. (2007), 'Syndrom chorego budynku', <www.muratorplus.pl>.
Zirakzadeh, C. (1997), *Social movements in politics: a comparative study*, London & New York: Longman.
Znaniecki, P. (2003), *Zielone znaki, czyli jak wybrać produkty przyjazne środowisku*, Krakow: PZS.
Zuziak, Z.K. (1998), *Strategie rewitalizacji przestrzeni śródmiejskiej*, Krakow: Wydawnictwo Politechniki Krakowskiej.
Zysnarski, J. (2003), *Partnerstwo publiczno-prywatne: teoria i praktyka*, Gdańsk: ODDK.

Żylicz, T. (1989), *Ekonomia wobec problemów środowiska przyrodniczego*, Warsaw: PWN.
Żylicz, T. (2001), 'Wiara i nauka a sprawiedliwość międzypokoleniowa', in: Białecka, A., Jadacki, J.J. (eds), *U progu trzeciego tysiąclecia. Człowiek – Nauka – Wiara*, Warsaw: Semper, 163–170.
Żylicz, T. (2004), *Ekonomia środowiska i zasobów naturalnych*, Warsaw: PWE.

Index

Challenges of Sustainable Development in Poland

This book is at once a guide for sustainable development professionals and a handbook for those interested in further studies on sustainability. It not only explains and exemplifies the issues of sustainability discussed herein, but it also offers a resource for practitioners in business, local authorities, non-governmental organisations and indeed individuals, wanting to undertake activities directed towards sustainable development.

This book consists of 15 chapters supplemented with descriptions of sustainability tools and related case studies in Poland. These case studies are particularly useful for both teaching and practical application. In preparing this book, the authors have applied their extensive practical and research experience in this.

This book aims to open up views on a very different world, one that can flourish without growing and prosper without polluting. Ideas that in Poland have emerged from decades of exploration by Poles can offer inspiration to everyone that they too can join experiments that demonstrate how we can live securely even in a world changing faster than it has done in living memory. Sustainability is not a credo to be adopted, it is an inspiration to test ideas and experiment. Polish experience in this regard teaches that to survive one has to get up and ride on the waves of change, even as we invent and build the vessels with which we will ride upon them.

Dr Jan Sendzimir, from the foreword

Although the paradigm of sustainable development is widely accepted by the international community, educated citizens of Poland remain unaware of its principles more generally. Therefore a course on sustainable development taught at all universities and in all fields of studies will help to change this situation. However, until now there has been no textbook that could be used as a basis for such a course. This book meets this need.

Professor Ryszard Janikowski

The book is particularly relevant because it highlights the Polish situation with regards to sustainability.

Professor Leszek Preisner