Sustainable Development Research at ICIS

Maastricht University

International Centre for Integrated assessment and Sustainable development

Sustainable Development Research at ICIS
Taking stock and looking ahead

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ICIS – Maastricht University

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Part I Introduction

Chapter 1

Sustainable development research at ICIS

Ron Cörvers, Joop de Kraker, René Kemp, Pim Martens and Harro van Lente

Abstract

This book presents an overview of the diversity and richness of ongoing and recent sustainable development research at ICIS, the International Centre for Integrated assessment and Sustainable development at Maastricht University. In this introductory chapter, we first discuss the concept of sustainable development and its aim of harmonising the socio-economic development of societies and communities with the protection of nature and the environment. It has become increasingly clear that major changes are needed to achieve this aim, and that sustainable development is not an easy or straightforward process. Next, we discuss the emerging academic field of sustainability science, which addresses sustainable development problems in an integrative and transformative way to find solutions and pathways to sustainability. ICIS positions itself in this field with the aim of contributing to the scientific knowledge base for policy making and innovation in pursuit of sustainable development. It focuses on the local and regional levels within the context of global sustainability. An important feature of ICIS research is its contribution to sustainability assessment. Finally, we give an overview of how this book is structured according to the environmental, socio-economic, and political-institutional dimensions of sustainable development, including a section on methods of knowledge production for sustainable development.

1.1 Introduction

ICIS, the International Centre for Integrated assessment and Sustainable development at Maastricht University was founded in 1998. The institute started as a centre for integrative studies and has become a leading institute in research and education for sustainable development. In 35 short chapters, this book presents an overview of the diversity and richness of recent and on-going sustainable development research at ICIS. In the last chapter, we reflect on the research presented and introduce ICIS' research agenda for the coming years. The book is intended for a broad audience of fellow researchers, collaborators from outside academia, students, and in fact everyone who is interested in learning more about the topics and types of research conducted at ICIS. In this introductory chapter, we first discuss the concept of sustainable development. We then focus on sustainability science and the position of ICIS in this emerging academic field. Finally, we give an overview of the content of various chapters of the book and how these are structured into four parts. This last section as well as the table of contents will help readers locate the chapters that interest them.

1.2 Sustainable development

On 1 January 2016, the Sustainable Development Goals (SDGs) came into force. Adopted by world leaders at a historic UN summit, these 17 goals call for action by all countries to promote prosperity while protecting the planet (UN, 2016). This shows how, almost 30 years after the UN report *Our Common Future*, the concept of sustainable development has become a guiding principle at every level of human society: the global community, international organisations, governments, businesses, civil society groups, and citizens. In the UN report, published by the World Commission on Environment and Development and also known as the Brundtland report, we find the best-known definition of the concept: "Sustainable development is development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs" (WCED, 1987). The concept is elaborated in much greater detail in "Transforming our world: the 2030 Agenda for Sustainable Development", the UN resolution specifying the Sustainable Development Goals, which stresses that ending poverty and hunger while addressing climate change and environmental protection must go hand-in-hand with strategies to meet social needs such as good health, education, and equality (UN, 2015). The 2030 Agenda emphasises the need for partnerships given the worldwide interdependencies involved in achieving the SDGs. These interdependencies arise from complex relationships between different but interconnected systems, such as the global environment and the global economy, national ecosystems, and economies, through international trade and global value chains, governance and political systems, and the socio-cultural identity of societies and groups. These issues cannot be addressed on their own when striving for sustainable development – yet integration is not straightforward either.

Due to these multiple dimensions and connections, sustainable development is an extremely complex challenge. A pertinent difficulty is the need to integrate the inputs from many different disciplines, from scientific as well as practical knowledge, considering that such inputs are uncertain and diverse in themselves. In addition, the concept of sustainable development can be characterised as normative, subjective, and ambiguous (Grosskurth and Rotmans, 2004). The normative principle in the concept is that of inter- and intra-generational equity. Although this principle as such is widely agreed upon, its interpretation varies, and consensus is often lacking when more specific standards are derived from this general principle (such as a balance between environmental, economic, and social aspects or staying within planetary boundaries). The concept is also of a subjective nature, as the interpretation of human needs in particular depends on personal views or preferences. People are bound to differ in their opinion as to what are important needs, and when these needs are sufficiently fulfilled. As a consequence, they will also differ in their choice of targets for sustainable development. Finally, the concept of sustainable development is also ambiguous, as it does not contain a clear statement on the relative priority or weight of the ecological, economic, and socio-cultural aspects of development. Similar to freedom and justice, sustainable development is a multi-interpretable concept and "involves making choices, and perhaps trade-off decisions, on highly contested issues (which is to say that in some cases the notion of a 'trade-off' might prove to be no more than a euphemism for fundamental irresolvable dilemmas)". (Farrell et al. 2005).

These four characteristics, complexity, normativity, subjectivity, and ambiguity, make operationalisation of the concept of sustainable development in policies at all levels a value-laden matter (De Kraker and Cörvers, 2006). Sustainable development derives from social consensus on what is considered to be unsustainable and what constitutes progress, perspectives that will differ across nations and localities. The substantive content of sustainable development cannot be scientifically determined as "objective knowledge", but will always incorporate normative valuations that only become established in the process of social interaction – in parliaments and other fora – (Voss & Kemp, 2006) (from Kemp and Martens, 2007, p.7).

As a consequence, defining and implementing sustainable development is not an easy or straightforward process. Any interpretation will meet with opposition from those who stand to lose. In particular, the huge gap in our world between the livelihood conditions of millions of its poor versus the hyper-consumption by the happy few is a key ethical issue when pursuing sustainable development. Also within developed countries there are conflicts over the need for and desirability of particular policies and solutions.

Clearly, the support and active involvement of many actors is necessary to put the idea of sustainable development into practice. Different actors and stakeholders will have to meet in societal and policy arenas to discuss pathways towards sustainable development. Innovations, transitions, and small and major changes are required by numerous actors in different sectors at different levels of scale and for decades to come, to implement the underlying principles of sustainable development.

1.3 Sustainability science at ICIS

Ever since the introduction of the concept, scientists from all kinds of disciplines have made explicit efforts to contribute to sustainable development with relevant knowledge and insights. Many scientists felt, however, that some kind of coordination was desirable to reach a higher level of integration in order to make these scientific contributions more useful and effective. Fifteen years ago, the concept of sustainability science was proposed by a group of researchers mostly working on global environmental systems dynamics (Kates et al., 2001). Sustainability science is not intended as an autonomous discipline, but as a field of study employing a variety of disciplines and bringing natural and social scientists together in studying the complex interactions between nature and society, as well as society's capacity to steer these interactions along more sustainable trajectories. The characteristics of sustainable development as described above are reflected in the description of sustainability science as (Kates et al., 2001; Clark & Dickson, 2003; Heinrichs, 2016):

- spanning spatial and temporal scales (local to global, short- to long-term);
- addressing complex interactions and cause-and-effect relationships;
- explicitly considering knowledge uncertainties;
- recognising the wide range of perspectives and value-based positions;
- working with practitioners, policy makers and stakeholders to co-produce useful knowledge.

Above all, sustainability science is problem-driven, with the overarching goal of facilitating transitions towards sustainability (Clark, 2007). In practice, the emphasis is often either on understanding the problems or on developing solution strategies (Wiek et al., 2012). The former type of research focusses on analysing the dynamics of coupled social-ecological systems, based on systems theory and modelling, whereas the latter focusses on complex sustainability issues at local to regional scales, and the application of transdisciplinary research methods. The latter mode has been labelled "transformational", to emphasise its aim of producing actionable knowledge and effecting real-world change towards sustainability (Wiek et al., 2012, 2015).

ICIS was founded in 1998, before the concept of sustainability science was introduced, but the characteristics of sustainability science fit the research conducted at ICIS right from the beginning. ICIS started as a centre specialising in Integrated Assessment, an approach which more recently has developed into Sustainability Assessment, defined as "a structured process dealing with a sustainability issue, using knowledge from various scientific disciplines and/or stakeholders, such that integrated insights are made available to decision makers". In the early years, research almost exclusively focussed on the development of new methods, tools, and approaches for the integrated assessment of complex sustainability problems. Although this book makes it abundantly clear that research at ICIS has become much more diverse, methodological advancement of sustainability assessment is still an important line of research. This includes work on novel tools as well as on processes of joint knowledge production and co-creation. Regarding sustainability assessment, perhaps more so than the other lines of research at ICIS, there is a close interaction between research and education, as it forms the heart of ICIS' Master's programme on Sustainability Science and Policy.

In addition to sustainability assessment, other major research themes at ICIS are governance and innovation for sustainable development, reflecting an increased interest in a better understanding of complex interactions with an analytical focus on "society's capacity to steer those interactions along more sustainable trajectories". Overall, sustainability science at ICIS is more solution-oriented than problem-focused. ICIS' vision is for sustainability science to provide the scientific knowledge base for policy making and innovation in the pursuit of sustainable development. ICIS' mission is to use its scientific knowledge and expertise to contribute to sustainable development at the local and regional levels, as a basis for global sustainability. At ICIS, researchers from the natural and social sciences study sustainable development problems in their environmental, economic, social, cultural, and institutional context. ICIS researchers are mindful of the limits of scientific knowledge, and accept that sustainable development is inherently normative. Knowledge production and integration are equally important, as the research should be of practical value to end-users. Therefore, values and perspectives are also relevant sources of information, in addition to scientific findings about facts and causal links. The projects ICIS implements vary from large-scale projects undertaken by international multi-actor consortia to narrowly defined projects carried out by individual PhD candidates. Most projects include collaboration with other research institutes, but increasingly also with other actors, such as governments, businesses and NGOs. This contributes to ICIS' expertise in action-research and transdisciplinary work.

1.4 Outline of the book

As the starting point for this book, we embraced the idea of showing the diversity and richness of ongoing and recent sustainable development research at ICIS. The book is structured along the different dimensions of sustainable development, as we expect most readers to be familiar with this classification. We distinguish: the environmental dimension (Part II); the socio-economic dimension (Part III); and the political-institutional dimension (Part IV) of sustainable development. There is also a part on methods for knowledge production (Part V), since methodological advancement of the production, integration, and use of knowledge for sustainable development is at the heart of research work at ICIS. Each part consists of several chapters, making up 35 chapters in total. For most chapters it is quite clear what dimension of sustainable development it focusses on, but the positioning of some other chapters within a particular part is debatable and is the full responsibility of the editors. The positioning of chapters within the various parts of the book is intended to help readers more easily locate the chapters or topics that interest them.

All authors were asked by the editors to reflect in their chapter on the challenges for integrative sustainable development research. As editors, we identified three main challenges for addressing sustainable development problems in an integrative and transformative way: (1) embracing complexity (by considering it explicitly); (2) including normativity (accepting that sustainable development is inherently normative); and (3) spanning boundaries (between the different worlds of science, policy and society). Let us now introduce the chapters.

In *Part II*, *The environmental dimension of sustainable development*, Carijn Beumer in Chapter 2 discusses the possibility of bringing the problem of biodiversity loss closer to Western citizens by using the Biodiversity In My Back Yard tool (BIMBY). In Chapter 3 Bram Oosterbroek introduces the complexity of the relation between ecosystems and health and distinguishes several ecosystem services and disservices related to human health. Maud Huynen and Pim Martens continue the discussion in Chapter 4 by analysing highland malaria in Africa and identifying some important non-climate factors that are crucial for a major health risk induced by climate change.

In *Part III*, *The socio-economic dimension of sustainable development*, Annemarie van Zeijl-Rozema in Chapter 5 explores to what extent sustainable development is a guiding principle for the general public, a topic she analysed for the Dutch province of Limburg. In Chapter 6 René Kemp and Harro van Lente discuss two challenges for sustainability transitions: technological change and values change. They analyse the hygienic transition that took place around 1900 and the waste management transitions at the end of the twentieth century. In the next chapter Harro van Lente discusses two important elements of sustainable development: needs and innovation. He argues that technological change shows that needs are not the starting point of innovation but are co-produced in the process. Chapter 8, by Véronique Vasseur and René Kemp, discusses the adoption of solar photovoltaic (PV) systems in Dutch households. They conclude that the adoption and diffusion of solar PV depends on the evolution of consumer preferences, product offerings and policies to promote the use of renewables. A similar topic is addressed by Sjouke Beemsterboer in Chapter 9. He argues that a more sustainable energy system requires various issues to be taken into account: access and security, climate change and environmental impact, and economic and social development. In Chapter 10 Nancy Bocken and Anja van Bogaert discuss a new role for the business community in society, contributing to shared value creation and as a solution to global sustainability challenges. In Chapter 11 Marc Dijk and René Kemp discuss the challenges for the transition to a circular economy, illustrated by the case of passenger mobility as a resource-intensive form of mobility. Paul Weaver in Chapter 12 discusses the role of the informal economy in the context of the Post-2015 Sustainable Development Goals (SDGs). In Chapter 13 Jing Wang and Harro van Lente examine the relationship between cultural diversity and sustainable development by focussing on three rural areas in the Shaanxi province of China. The role of culture in sustainable development is also discussed by Laura Kurth in Chapter 14 where she analyses halal food production and consumption in the Netherlands as an example of contested religious practice.

In *Part IV*, *The political-institutional dimension of sustainable development*, Ceren Pekdemir in Chapter 15 discusses the institutional changes in the international regulation of fair labour and concludes that the complementary shift from private responsibility to private accountability has yet to occur. In Chapter 16 Muhammad Ibnu, Sani Kosasih, Nia Kurniawati Hidayat, Astrid Offermans, Esther Sri Astuti, and Atika Wijaya analyse the effects of global certification of agricultural products on farmers in Indonesia and discuss the responses by farmers, Southern governments, and non-governmental organisations (NGOs) to certification schemes which are mostly developed by Northern-based collaborations between businesses and NGOs. Chapter 17, by Joana Mattei Faggin and Astrid Offermans, discusses the potentials of Sustainable Forest Management (SFM), which aims to use forest resources in such a way as to provide environmental services while at the same time achieving economic and social goals. In Chapter 18 Martina Kühner discusses the role of "soft" monitoring instruments within the Kyoto Protocol and offers recommendations for the institutional design of a compliance monitoring system for a post-2020 climate regime. Marjan Peeters in Chapter 19 discusses the need for cross-cutting studies regarding the question how the reduction of greenhouse gas emissions, particularly by means of "emissions trading", can be regulated in an effective and efficient manner within the boundaries of the rule of law. In Chapter 20 Julian Blohmke, René Kemp, and Serdar Türkeli analyse the causal structure underlying environmental regulation with the help of Structural Equation Modelling (SEM) and conclude that green advocacy and strong governance capacity are the main structural determinants of environmental regulation stringency. In Chapter 21 Julia Backhaus and Harro van Lente analyse a dietary change programme for German schoolchildren and discuss how people involved in change initiatives subscribe to assumptions about what is at stake and how changes in lifestyles can be achieved. Chapter 22, by Astrid Offermans, Ron Cörvers, and Joop de Kraker, discusses the diversity of perspectives on sustainable development among students of the Master's programme on Sustainability Science and Policy at Maastricht University.

In *Part V*, *Methods of knowledge production for sustainable development*, Maud Huynen and Pim Martens in Chapter 23 present a conceptual framework for globalisation and population health to address complex global health issues from a systems perspective. In Chapter 24 Alex Baker-Shelley discusses the example of action research for transformations towards sustainability at Maastricht University to exemplify the value of participation and the social impact of organisational research. Chapter 25, by Astrid Offermans, presents the Perspectives Method to operationalise, assess, and monitor perspectives, and applies it to river management. In Chapter 26 Astrid Offermans and René Kemp apply the Perspectives method to the topic of joint knowledge production (JKP), defined as a process in which scientists and policy makers collaborate in order to develop results that are relevant to both. To what extent knowledge processes in partnerships can be understood as joint knowledge production (JKP) is discussed by Astrid Offermans and Pieter Glasbergen in Chapter 27 by analysing the Round Table on Sustainable Palm Oil (RSPO). In Chapter 28 Reina Pasma and René Cimmermans discuss the policy concept of dynamic stock management developed in a co-creative process with stakeholders and local authorities and implemented in the Dutch province of Limburg. Chapter 28, by Joop de Kraker, Ron Cörvers, Christian Scholl, and Tim van Wanroij, discusses urban labs as a new governance approach in which local governments engage in a problem-solving process together with other stakeholders of urban development, based on their experiences with Maastricht-LAB. In Chapter 30 Joop de Kraker and Marc Dijk discuss how Sustainability Assessment (SA) may be used to structure complex sustainability problems, and discuss SA approaches developed at ICIS from this perspective. In Chapter 31 Paul Weaver discusses Integrated Sustainability Assessment (ISA) as a framework that provides a coherent approach capable of structuring effective sustainability assessment processes in a wide range of contexts, and supporting programmes of implementation. In Chapter 32 Su-Mia Akin, Pim Martens, and Maud Huynen discuss the complexity of the relation between globalisation and health, and present an indicator-based statistical analysis to link the Maastricht Globalisation Index (MGI) to health indicators. Lukas Figge and Pim Martens in Chapter 34 present a revised and updated Maastricht Globalisation Index (MGI), which shows that globalisation still continues but has slowed down recently.

Part VI, *Science for sustainable development*, contains only one chapter, Chapter 35, in which Ron Cörvers and Joop de Kraker reflect on the contributions to this book, arrive at a synthesis and present the ICIS research agenda for the coming years.

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Part II
Sustainable development research at ICIS: the environmental dimension

Chapter 2

The missing piece of the conservation puzzle: involving Western citizens in the conservation debate

Carijn Beumer

Abstract

Biodiversity loss is closely related to global processes of production for Western consumerist lifestyles. However, consumption patterns of affluent societies are largely absent from the conservation discussion. Although conservation of biodiversity concerns each and every one on the planet with respect to health and survival, the main activities to achieve it are largely "outsourced" to the places and communities where they may matter directly, but where perhaps the least effects can be gained. To bring the issue of biodiversity loss closer to citizens, more conservation efforts have to be directed towards reconnecting people with nature. An ideal low-threshold urban location to encourage this reconnection is the domestic garden. New tools like the Biodiversity in My Back Yard framework (BIMBY) can help citizens start to perceive biodiversity conservation as something they can contribute to in their daily lives.

2.1 Introduction: the missing piece

If one is asked to describe a conservationist, it is easy to imagine a researcher with a khaki-coloured hat and binoculars around her neck taking samples of elephant poo in the African savannahs or to imagine a sweaty person climbing trees to count insect species in the upper canopy in the rainforest of Borneo or the Amazon. In Western societies, the concept of biodiversity seems quite far removed from our daily lives and urban lifestyles. Conservation is something being done by specialist biologists, ecologists, conservationists; a task for specialised field researchers or NGOs like the WWF or the International Union for Nature Conservation (IUCN).

The history of conservation has been characterised by debates about what conservation should actually involve. Should nature be *conserved* or *preserved* (T. R. Miller et al., 2011; Minteer et al., 2011; Robinson, 2011; Takacs, 1996)? The difference between these words seems futile, but in the "conservation debate" (DesJardins, 2006; T. R. Miller et al., 2011; Minteer et al., 2011; Robinson, 2011; Takacs, 1996) they led to two rather divergent protective approaches: *preservation* became associated with a profound ecology discourse (Capra, 1996) where –broadly speaking – nature has intrinsic value and integrity and should be left alone, preferably without any human interference. *Conservation* became associated with a more utilitarian discourse, where nature has value to human beings and should be protected to ensure our future existence, so its resources should be managed carefully (DesJardins, 2006; Takacs, 1996). An intermediate alternative to these two ends of the spectrum was found in the trend of establishing so-called Integrated Conservation and Development Projects (ICDPs) (J. R. Miller et al., 2002). This type of project brings together the protection of nature and the human needs of (indigenous) communities in the non-Western world.

This conservation discourse has recently been pragmatically enriched with visions of a "Green Economy" where conservation becomes "mainstreamed" (CBD, 2008; Marris, 2007) into governance and business. In practice this means that conservation organisations are increasingly focused on building partnerships with companies that have a large environmental impact (Morrow, 2012; UNEP, 2011). Despite all the efforts, despite new conceptualisations, despite newly forged alliances, and despite integration and mainstreaming of biodiversity conservation in local, regional, and global governance strategies, global biodiversity loss continues at unprecedented pace. Why does this happen? Are we still missing a piece of the conservation puzzle?

An analysis of the discourse of the Millennium Ecosystem Assessment scenarios, IPCC scenarios (Beumer et al., 2010), and IUCN documents (Beumer et al., 2013) on biodiversity conservation strategies, visions, and efforts reveals that Western lifestyles and consumption patterns are largely lacking from the conservation discussion. Although conservation of biodiversity concerns each and every one on the planet with respect to health and survival, the main activities to achieve it are largely "outsourced" to the places and communities where they may matter directly, but where perhaps the least effects can be gained. Whereas the climate and energy issue has become a part of the daily lives and choices of citizens, this is not the case with biodiversity. According to the Eurobarometer, which assesses attitudes of European citizens towards biodiversity, "[a]cross the EU, slightly less than half of Europeans have heard of the term 'biodiversity' and know what it means (44%) (European Commission, 2013, p.4)." Also, more than half of the European citizens feel that they are not informed about biodiversity loss (54%) (European Commission, 2013).

Biodiversity loss is closely related to global processes of production for Western consumerist culture. Eating meat, consuming products containing palm-oil, large-scale intensive farming, mining, fishing with large trawlers – just to mention a few examples – are some of the largest drivers of the loss of biodiversity (CBD, 2014; MEA, 2005; Steffen et al., 2005). It thus seems simple logic that the knowledge about biodiversity and about the causes of its loss should become just as embedded in the daily patterns and choices of citizens in affluent societies as the climate issue. How can a complex issue such as biodiversity conservation be incorporated in the minds and actions of Western citizens?

Recently, Robert Dunn examined the mechanism of the "pigeon paradox" (Dunn et al., 2006). This mechanism entails that if people get in touch with nature in their immediate living environment – be it wild, rural, or urban nature – they are more inclined to adopt a positive attitude towards nature and conservation on larger scale levels as well (Dunn et al., 2006; Müller et al., 2010). Positive experiences and encounters with nature in the individual sphere of life increase the potential for a love of nature and biodiversity in a broader, more global sense (Beatley, 2011). This has also been confirmed by the work of a number of other researchers (Austin, 1894; Cilliers, 2010; IUCN, 2010, 2012; Millard, 2010; Müller et al., 2010).

Considering these research results, experiencing nature close to home may provide a good start to increasing conservation awareness in affluent societies. And where can nature be found closer to home than in one's own front- or back-yard?

In many parts of the Western world, individual citizens have complete – or at least considerable – autonomy with regard to the way their domestic gardens can be designed and used. We have considerable power in our small private outdoor spaces. All these small urban green spaces together take up a large part of urban space in many cities, sometimes up to 40% (Zwaagstra, 2014). Therefore, if domestic gardens are designed with concerns for nature and biodiversity in mind, all the little patches make up quite a large surface benefiting nature (Kettunen et al., 2007; Mitchell et al., 2013; Rudd et al., 2002).

Domestic gardens can also be "experimental and experiential learning centres" on urban and regional flora and fauna for citizens, researchers, policymakers, designers, and even commercial parties: what works well in a garden in a specific biome and what does not? How do various species relate to each other? What is a pleasant level of flora and fauna in a home garden? What ecosystem services does a garden deliver? What kinds of disservices are encountered (Lyytimäki et al., 2008)? How are the services provided by gardens mediated to people by cultural contexts, assumptions, and traditions? How can gardens help citizens become more self-sustaining, for example by providing food? What does such self-sustenance mean for the (global) economy and agricultural food production? How far do the environmental, social, and economic impacts of a garden reach? These are just a few questions that could be discussed in the lounge seats of the home garden. The domestic garden provides great potential for putting biodiversity on citizens' agendas. However, the dialogue may need to be stimulated, as not a lot of people are aware of this potential (Beumer, 2014).

In order to encourage a societal dialogue on such questions, the BIMBY framework (*Biodiversity in My Back Yard*) has been developed (Beumer et al., 2015). The aim of this indicator framework is to stimulate an inclusive and participatory approach to building a body of knowledge about the benefits of domestic gardens for biodiversity, ecosystem services, and a sustainable environment. Citizens can walk around their gardens with a questionnaire that asks them about the things they encounter there (biotic and a-biotic), about the way they keep their gardens, special values they attach to their gardens, nuisances and pleasures their gardens provide (ecosystem services), and the relations between their gardens and the outside world. BIMBY is designed to increase awareness and to stimulate dialogue and knowledge co-production on the values, uses, and small-scale biotic and socio-cultural features that enhance or impede the quality, variety, and abundance of biodiversity in and beyond the home garden and in and beyond urban areas. BIMBY may facilitate efforts to include cities *and* citizens in conservation practices, which is also reflected in strategic goal A of the *Aichi* Biodiversity Targets: it aims to "[a]ddress the underlying causes of biodiversity loss by mainstreaming biodiversity across government *and society* (CBD, 2011)".

2.2 Lessons to be learned

BIMBY may be able to support the emergence of new sustainable "design paradigms" (Felson & Pickett, 2005). It may help the public learn about ways to combine aesthetic pleasure and practical functionality with ecological integrity and awareness of wider ecosystem processes and relations. Much can be learned by comparing the assessment results of gardens in various cities around the world and their meaning for nature, at scale levels that reach far beyond cities (regional, cross-regional, global). Much can also be learned in gardens about the connections between biological and cultural diversity. How do gardens reflect the perspective that people have on nature? Do garden cultures around the world indeed reflect cultural diversity? Or is there a globalised garden culture? What is "sustainable gardening" and how can gardening discourse, design, and practice be best integrated in the conservation debate? And more practically: what is the potential of domestic gardens to contribute to global biodiversity conservation?

Such a novel urban-based approach to conservation may contribute to awareness of global biodiversity loss, and may encourage citizens to look at their own consumption patterns in a different way. BIMBY can help citizens perceive global biodiversity issues in the same manner as global climate change has come to be perceived: as something we all contribute to, and as something we all can help do something about. Of course it remains to be seen if gardens can indeed provide the crucial missing pieces in the puzzle that is the conservation of global biodiversity.

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Chapter 3

The impact of ecosystems on human health

Bram Oosterbroek

Abstract

According to the Millennium Ecosystem Assessment (MA), approximately 60% of the services that ecosystems provide to humans are being degraded or used unsustainably. This also impacts on human health, which is one of the main categories of wellbeing considered by the MA. From a long-term societal perspective, preserving or restoring ecosystems is sometimes a better idea than applying technological solutions, as this can lead to more human wellbeing and lower costs. However, several aspects add to the complexity of the ecosystem–health relation, making it difficult to see the value of these ecosystem services. Examples are complex cause–effect chains with long-term effects, intertwined socio-economic processes and the existence of both positive and negative effects of ecosystems on human health. Research into how ecosystem alteration impacts on human health could benefit various stakeholder groups and society. This chapter zooms in on some research objectives with both scientific and societal relevance.

3.1 Introduction

Due to population growth, land use-change and climate change, humans are increasingly exerting pressure on the ecosystems that surround them and in which they live. (Ecosystems are complexes of plant, animal, and microorganism communities and the non-living environment.) The consequences that ecosystem change can have for human wellbeing became clear through the work of more than 1300 experts worldwide within the Millennium Ecosystem Assessment (MA). Although the transformation of the planet has contributed to substantial net gains in human wellbeing, the costs associated with these gains are only recently becoming apparent: the MA (Millennium Ecosystem Assessment 2005, see references for website link) assessed the state of “ecosystem services”, which are services that ecosystems provide to humans. Approximately 60% of the ecosystem services examined, ranging from regulation of air quality to reduction of natural disasters, are being degraded or used unsustainably. This also impacts on human health, which is one of the main categories of well-being considered by the MA. Arguing from the “health side” of the problem, the World Health Organisation (WHO) also realises the important place ecosystems take amongst other environmental factors influencing human health (World Health Organization 2015, see below for website link). The MA’s Health Synthesis report (MA 2005), written in collaboration with the WHO, is specifically devoted to the connection between ecosystems and human health.

A famous ecosystem services project that also illustrates an ecosystem service related to human health is that of New York’s watershed filtration services: New York’s 9 million inhabitants obtain 90% of their drinking water supplies from the Catskill and Delaware watersheds, situated 130 miles outside the city, which filter water through the ecosystem's waterways and wetlands. Historically, these watersheds provided very high quality drinking water, but by the late 1980s, the water quality had degraded through a combination of land conversion, development, and negligence. The estimated construction costs of building a water filtration plant were at least $6 billion, and a further $300 million in annual operating costs. Instead, therefore, the Catskill and Delaware watersheds were restored. The cost of restoring these ecosystems and hence their water filtration services were a maximum of $1.5 billion (Hancock 2010).

The New York water filtration story can be called a success from the point of view that maintaining ecosystem services is sometimes a better idea than applying technological solutions. However, the story is not undebated (Ecosystem Marketplace 2006, see below for website link). Moreover, many scientists claim that we also have to be aware of the existence of ecosystem disservices (functions of ecosystems that are perceived as negative for human wellbeing), and that they also need to be taken into account when choosing between land-use management options. Historically, this weighing of trade-offs between services and disservices was relatively easy, because overall stress on ecosystems was sufficiently small to allow the focus to be on manipulating ecosystems to get rid of the disservice. For example, a few hundred kilometres to the south of the New York watershed, other wetlands were causing an ecosystem disservice to the inhabitants of Washington D.C. in the form of the infectious disease malaria. Malaria-infested wetlands were therefore drained. At that time, water filtration did not affect the supply of high-quality water to the capital. Currently, however, the intensity of human land-use change has put this ecosystem service of water filtration under stress as well, making it necessary to come up with management options that stimulate ecosystem services, whilst not stimulating disservices. The problem is made more complex by the driver represented by climate change, which is suspected to make more northern regions of the world more suitable habitats for mosquito-borne diseases. Tools are required that render the different services and disservices visible, provide insight into their cause-effect relationships, and quantify the trade-offs.

The scientific community has produced many basic conceptual diagrams providing an overview of the link between ecosystems and human health. The relation between ecosystems and human health from an ecosystem services and disservices perspective is shown in Box 3.1. This overview of the ecosystem–human health theme leads to many questions, important ones being: How are the ecosystem services and health outcomes related? Are there important non-ecosystem-related factors contributing to the increase or decrease in health outcome, like social and economic processes? When do ecosystem services and disservices interact? What is the relative contribution of ecosystems to globally important diseases? What is the time scale at which a driver of ecosystem change has an effect on human health? And in which regions do the diseases occur?

Box 3.1 Several ecosystem services and disservices related to human health

Services

Provisioning

1. Provision of food
2. Provision of genetic resources and natural products
3. Provision of timber, fiber and fuel

Regulating

4. Air purification
5. Biological control of infectious diseases
6. Environmental microbial diversity
7. Noise reduction
8. Climate stabilization (cooling)
9. Protection from natural hazards (such as floods & droughts)
10. Waste management, processing and detoxification
11. Water purification

Cultural

12. Promotion of social interactions and cultural traditions
13. Recreation & nature experience

14. Provision of aesthetic environments

Disservices

1. Increased prevalence of allergens
2. Inhibiting human safety (for example falling branches, collisions with animals, dangerous wild animals, plant protection mechanisms)
3. Source of infectious diseases
4. Decreasing air quality
5. Decreasing water quality and/or quantity
6. Bringing about negative psychological effects

3.2 Complexity of the relation between ecosystems and human health

The report by the World Health Organisation on ecosystems and human wellbeing states: "The causal links between environmental change and human health are complex because often they are indirect, displaced in space and time and dependent on a number of modifying forces". The following aspects increase the complexity of the ecosystem–health relation, whilst they are also significant parts of its mechanism:

1. Multiple drivers of ecosystem change: Changes in climate, land use and resource availability drive ecosystem changes and the impacts of these drivers on ecosystem services can also change over time.
2. Long and complex cause-effect chains: The cause-effect chains between driver, ecosystem condition and human health are often long, long-term and complex, due to non-linearity and feedback loops.
3. Multiple and diverse health impacts: Degradation of a specific ecosystem type can produce several very different health outcomes. Forest conversion for example, can cause an increase in infectious diseases, malnutrition and mental disorders.
4. Ecosystem services as well as disservices: Ecosystems providing a health service preventing one particular disease can at the same time provide a health disservice enhancing another disease. Moreover, whilst some ecosystems provide a health service concerning a particular disease, other ecosystems could provide a health disservice for the same disease.
5. Spatial heterogeneity and multi-scalarity: The health outcomes associated with a particular ecosystem change (or a driver of change) can differ from location to location, and the underlying mechanisms as well. Some of these health impacts can be observed across one or several regions of the world, whilst others occur only locally. Moreover, global drivers of ecosystem change can have local health impacts and vice versa.

6. Interaction with socio-economic factors: Socio-economic factors are not only important health determinants themselves, but can also buffer or enhance the impact of ecosystems on human health.

In the past decade, the mechanisms of many linkages between the natural environment and health outcomes have been described in general terms, and the possible effects of tropical rain forest destruction on the discovery of new medicines have been well-documented. Recently, the specific biological mechanisms behind infectious diseases, and hence the relation between ecosystems and these diseases, is starting to be revealed. As regards other ecosystem–health relations, however, there are several knowledge gaps. Although some information is available on the influence of climate change on human health, no links, interlinkages, maps, and models to relate this driver to human health through ecosystem services have been explicitly documented. Few attempts have been made to gather health outcomes of ecosystems in an overview and to find the interlinkages. Such an overview could, for example, be useful to find drivers that cause multiple types of health outcomes, or to find ecosystem factors that contribute positively to one health outcome, but negatively to another.

There are several socio-economic processes that modify population-level vulnerability to ecosystem change and therefore make it hard to measure a direct correlation with health outcomes. Important processes are protection by infrastructure & technology, culturally determined or learned behaviours and the availability of health care. If we take our example of the loss of wetlands and their water-filtering capacity, this is less likely to cause disease among downstream populations if they have access to water filtration technology. An example of learned behaviours is that increased exposure to malaria leads to the use of mosquito bed nets and adapted behaviour, such as staying indoors during certain hours. Governance is another mediating factor of the health impact of ecosystem alteration: at regional, national, and international levels, the capacity to deliver resources can prevent local resource scarcity from causing severe health impacts (Myers and Patz 2009).

It is probably partially due to these complexity aspects that relations between ecosystem services and human health are often not quantified. Mapping and modelling ecosystem–health relations has also just started. The five complexity aspects of assessing the ecosystem–human health relationship are visualised and positioned in Figure 3.1.

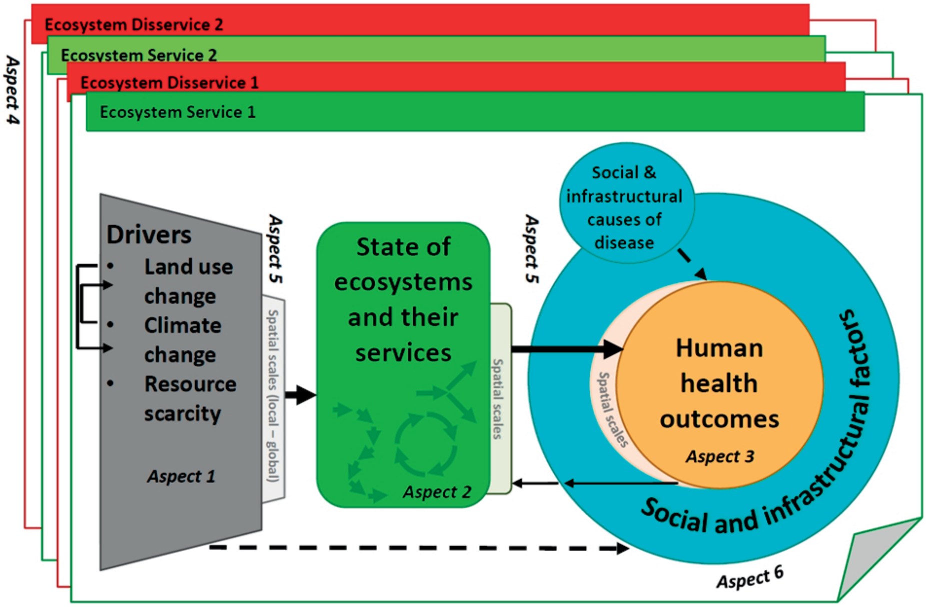

Figure 3.1 Conceptual framework for assessment of the impacts of ecosystems on human health. Thick black arrows: relations part of the main flow from drivers to health outcomes. Thin arrows: relations that create feedback loops and cross-connections. Dashed arrows: not part of an ecosystem-health assessment in a strict sense. In Italic: complexity aspects: 1) Multiple drivers of ecosystem change: 2) Long and complex cause-effect chains 3) Multiple and diverse health impacts 4) Ecosystem services as well as disservices 5) Spatial heterogeneity and multi-scalarity 6) Interaction with socio-economic factors. Figure adapted from Myers et al. (2013).

To cope with the multidisciplinarity and complexity of the effects of land-use change and climate change on several aspects of human wellbeing, sustainability scientists, environmental scientists, and policy scientists often strive towards an integrated (environmental / sustainability) assessment (IA). Acknowledged major aspects within this collective method include consideration of the long term, a cross-sectoral approach, changes in the impact of drivers, and multi-scalarity. However, the role of ecosystems as suppliers of both services and disservices to humans is an aspect not addressed yet in the IA approach. This might be an important reason why many ecosystem service assessments that do comprise several IA characteristics still lack an analysis of this balance. Many of the issues to which IA has been applied are relevant to human health, for example acidification, climate change, air pollution, and catchment management. However, few integrated assessments have been performed explicitly that included human health (Briggs 2008).

3.3 Transcending boundaries

The realisation of the importance of the ecosystem–human health connection does not solely come from the authors of the human health related chapters within the MA: it also comes from many other scientists in the field of health sciences (epidemiology, public health), natural sciences (ecology, biology), social sciences (economics, political science, sociology) and more interdisciplinary fields of science (environmental sciences, sustainability sciences). Beyond the science realm, at least four stakeholder groups could benefit from more knowledge on ecosystem–health relations.

1. Decision-makers and landscape management authorities
2. Human health agencies
3. Governmental bodies and (consultancy) agencies that manage environmental factors such as air and water quality, land use, and urban design
4. Citizens initiating sustainability projects

For all of these stakeholders, a better understanding of the disease impacts of various ecosystem factors and their linkages to each other and to diseases would aid in designing or recommending preventive health measures that are most efficient, or that represent the relatively best trade-off. Concrete advantages would be a reduction of the disease burden to the population, a longer-term impact as compared to solely medical treatment, and a more equitable solution, beneficial across social groups (Prüss-Üstün and Corvalán 2006). Some stakeholders might also benefit from the research outcomes in the form of the reduction of healthcare and other costs.

Pursuing only more fundamental scientific and thus less applied research objectives such as “exploring the mechanistic linkages between land use, ecosystems, and human health” would leave too large a bridge to be constructed by the above-mentioned stakeholders to be able to reap the societal benefits. Monetary valuation of ecosystem services and trade-off assessments between land-management options are already being performed for ecosystem services in general, and similar exercises specifically for services affecting human health have also just started. It is especially the implementation of ecosystem–human health processes as modules in general ecosystem assessment models, along with other societal needs, which would be a promising development towards transcending the boundaries: such a model would be able to provide the stakeholders not only with an idea of the impact of different ecosystem management options on human health, but also with a shared means of communication about the ecosystem–health system (including a shared terminology). The next section zooms in on some research objectives with both scientific and societal relevance.

3.4 Implementations of ecosystem–health research

Estimating (future) contributions of land-use change to infectious disease risk

Infectious diseases as a group make the largest contribution to the global human health burden when expressed in disability-adjusted life years (WHO 2014). Infectious diseases led to 6.9 million estimated deaths in 2011, representing 13% of all causes of death. The subgroup of infectious and parasitic diseases that contributes greatly to the global health burden of the overall disease group is that of parasitic and vector diseases, being second only to diarrhoeal diseases (WHO 2014). Major factors that define the prevalence of these diseases are part of a web of complex interactions between disease, several animal species, and the relationship with their non-living environment. These diseases are partially prevented by the presence of a high level of species diversity. However, contact between human communities and natural ecosystems in the tropical regions increases the risk of human infections. Converting nature areas into farmland or by urbanisation may reduce the ability of natural systems to buffer against disease. Climate change could also allow vector-transmitted diseases to expand their distribution to more northern areas. More insight into the influence of these drivers and the ecosystem service and disservice processes will provide a better idea of how much humans are contributing to disease prevalence through land-management decisions.

Balancing services and disservices and the ecosystem attributable fraction

Many researchers and institutions are currently addressing the need to be able to weigh both the costs and benefits of particular ecosystems, habitats, and species. This will enable a better choice between land-management approaches, in order to maximise human wellbeing. Ecosystem services and disservices that affect human health have an important place in such assessments. Apart from ecosystems, socio-economic causes of human health improvement might have a larger impact on human health. Moreover, other causes of human health decline might also have a larger impact, perhaps in the opposite direction. Cures for diseases and disease prevention protocols might in some cases be very well able to overcome unfavourable human health outcomes created by the lack of ecosystem services. These may be reasons to doubt the relative contribution of ecosystem services to the overall effect on human health. Calculating the relative contributions of ecosystem services and disservices to human health as a fraction of the total burden of a disease will help put the relevance of ecosystems into perspective even more.

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Chapter 4

Climate change as an amplifier of health risks: highland malaria in Africa[1]

Maud Huynen and Pim Martens

[1] This chapter based on a review paper by Huynen, M., P. Martens, et al. (2013). Climate change: an amplifier of existing health risks in developing countries, in: *Environment, Development and Sustainability* 15(6): 1425-1442.

Abstract

The interactions between climate and non-climate factors are of vital importance in shaping human vulnerability to global warming. In this chapter, this is illustrated for an important health risk induced by climate change, namely highland malaria in Africa. Despite the known causal links between climate and malaria transmission dynamics, the anticipated future impacts on disease risk are still surrounded by uncertainty, partly due to the fact that the relationship between vector-borne disease incidence and climate variables is complicated by many non-climate factors. We discuss some important non-climate factors that are crucial in determining the vulnerability context in the face of global warming. Although we focus on the example of highland malaria in Africa, the need for a systems approach is equally valid for other health impacts (e.g. food security, heat waves, flooding, and health impacts related to water scarcity).

4.1 Introduction

Climate change is perceived as one of the most important future health risks (Costello, Abbas et al. 2009) and as a threat to the achievement of sustainable development (World Bank 2009). This arises from the fact that climate change can act as an important amplifier of existing health risks, particularly in developing regions.

According to the IPCC's fifth assessment report (IPCC 2013), the increase in global mean surface temperatures for 2081–2100 (relative to 1986–2005) is likely be in the range of 0.3°C to 4.8°C. The prospect of global warming is accompanied by increasing concern about its health impacts, including impacts on heat stress, flooding, infectious diseases, sanitation and water security, air quality (including aeroallergens such as pollen), and food security (McMichael, Woodruff et al. 2006; Comrie 2007; IPCC 2007; IPCC 2014). A joint report by The Lancet and University College London (UCL) (Costello, Abbas et al. 2009) stressed that "climate change is the biggest global health threat of the 21st century," as its impacts "will affect most populations in the next decades and put the lives and wellbeing of billions of people at increased risk."

The World Health Organisation's (WHO) Global Burden of Disease Project has estimated that climate change has been responsible for 5.5 million disability-adjusted life years (DALYs) lost in 2000 (WHO 2002), with developing countries bearing a disproportionately high share of this disease burden (McMichael, Campbell-Lendrum et al. 2004). Climate change impacts on health are of particular concern for the developing world, as global warming is believed to further exacerbate the already existing vulnerabilities to disease. Furthermore, it has been argued by the World Bank (2009) that unmanaged climate change will reverse important development progress in developing countries.

An ever growing number of health researchers (Albrecht, Freeman et al. 1998; Colwell 2004; McMichael 2005; Wilcox and Colwell 2005; Pearce and Merletti 2006; Lang 2012) argue that our health can or must be viewed within the broader system of health determinants. Populations are not simply collections of individuals, but are shaped by, and shape, the systemic context in which they operate (Pearce and Merletti 2006). Hence, the multitude of health determinants does not operate in isolation, but occur in a particular population context. In line with the increasing call for systems approaches to health, this chapter argues that vulnerability to climate change impacts should be seen within the broader "system/context" of health determination, including many non-climate factors. Taking such a systems perspective on health demonstrates that the interactions between climate and non-climate factors are of vital importance in shaping the high vulnerability to the adverse impacts of global warming in developed countries and especially developing countries.

This is illustrated below for an important climate change induced health risk, namely highland malaria in Africa. We examine in more detail some important linkages between climate and non-climate factors that are crucial in determining the vulnerability context in the face of global warming (Huynen, Martens et al. 2013). Finally, we conclude that understanding and addressing the interdependencies between factors that create a higher vulnerability to adverse health impacts is central to formulating effective climate change adaptation policies.

4.2 Climate change as an amplifier of malaria risk

Malaria is a life-threatening disease caused by Plasmodium parasites that are transmitted to people through the bites of infected mosquitoes. Malaria contributes greatly to the disease burden in the developing world (WHO 2002; FAO 2010; WHO 2011), negatively affecting development progress. Not surprisingly, lowering the number of malaria cases is an important Millennium Development Goal (UN 2012). While there has been some promising progress in tackling malaria (UN 2012), the observed declines in incidence and mortality are falling short of the ambitious Global Malaria Action Plan goals of reducing global malaria cases by 75% and preventable global malaria deaths to near-zero by 2015 (RBM Partnership 2008; UN 2012). According to the World Malaria Report 2011 (WHO 2011), there were about 216 million cases of malaria and an estimated 655,000 deaths in 2010. Others (Murray, Rosenfeld et al. 2012) suggest that mortality rates are even substantially higher. It is the people living in the poorest countries who are the most vulnerable to malaria; the WHO (2011) estimates that 90% of all malaria deaths in 2010 occurred in Africa.

Climate and climate change is believed to be an important factor in the dynamics of malaria transmission (Chaves and Koenraadt 2010; Caminade, Kovats et al. 2014; IPCC 2014). For example, temperature affects mosquito survival as well as parasite development (Martens, Kovats et al. 1999; IPCC 2007; Chaves and Koenraadt 2010). The influence of temperature on malaria development, however, appears to be nonlinear and vector-specific. Increased variations in temperature, when the maximum is close to the upper limit for vector and pathogen, tend to reduce transmission, while increased variations in mean daily temperature near the minimum boundary increase transmission (IPCC 2014). Additionally, mosquito survival is also affected by changes in humidity, while developments in rainfall patterns can affect the number of suitable breeding sites.

Most simulation studies have focussed on the impacts of changes in the general climate on potential shifts in the distribution and magnitude of endemic malaria in at-risk regions and on changes in regions at the margins of current endemic distributions (IPCC 2007). The health-impact models are typically based on climatic constraints on the development of the vector and/or parasite (IPCC 2007). Several approaches are being used to model malaria (e.g. multivariate statistical techniques, process-based biological models), and all have their specific advantages and disadvantages (Huynen, Martens et al. 2013). Some model studies (e.g. Martens et al.(1999), Ermert et al.(2012)) indicate a significant change in areas suitable for malaria mosquitoes or in malaria transmission;

others (Rogers and Randolph 2000) conclude that climate change will not result in any significant net change in malaria risk. In projections by Gething et al. (2010) the risk was even found to decline by 2050, due to control measures. The recent multimalaria model intercomparison exercise by Caminade et al. (2014) concluded that future climate might become more suitable for malaria transmission in the tropical highland regions.

Based on the outcomes of several modelling studies, climate change is believed to have mixed effects on malaria; some places will experience a reduction in the geographical range of the disease, while other locations will see an expanding geographic range and a changing transmission season (IPCC 2007). Despite the known causal links between climate and malaria transmission dynamics, the anticipated future impacts on disease risk are still surrounded by uncertainty, partly due to the fact that the relationship between vector-borne disease incidence and climate variables is complicated by many non-climate factors (IPCC 2007; IPCC 2014). The models used so far have included limited non-climate assumptions (IPCC 2007; IPCC 2014) and forecasts cannot be very precise, due to the sensitivity of nonlinear multidimensional systems to all of their underlying dynamics and interactions, especially those that are not accounted for by the models studied (Chaves and Koenraadt 2010).

Consequently, the search for important non-climate malaria drivers has become one of the major fields of inquiry (Chaves and Koenraadt 2010). In an elaborate literature review, Cohen et al. (2012) identified the following suggested causes of past malaria resurgence events: weakening of control activities (e.g. due to funding constraints, poor execution, purposeful cessation), technical problems (e.g. vector resistance, drug resistance), human or mosquito movement, development/industry changes (including land-use change), socio-economic weakening, climate/weather, and war. Malaria is also closely linked to poverty; poorer communities have a higher disease risk due to factors like less access to health services due to financial barriers, poorer nutritional status, lower education levels, poor sanitation, and inadequate housing (Ricci 2012). Although the above list is probably far from exhaustive, it clearly illustrates that climate change is just one of many processes that affect infectious disease risk. Hence, the assessment of the impacts of climate change on malaria is challenged by the complex interactions between climate and non-climate factors. Let us explore this in more detail by looking at the various drivers of malaria emergence in the East African highlands. The IPCC (2007), for example, explicitly expressed its concern about future climate change impacts on malaria risk in the highlands of East Africa. A recent study by Ermert et al. (2012) concluded that climate changes will significantly affect the spread of malaria in tropical Africa well before 2050, with a changing geographic distribution of the areas where malaria is epidemic (e.g., highlands) in the coming decades.

The numerous reports of increased malaria in the East African highlands have shown that malaria is becoming established in regions that belong to the territorial margins of its previous distribution (Lindsay and Martens 1998; Chaves and Koenraadt 2010; Tesi 2011; Himeidan and Kweka 2012). In the past two decades, there has been some debate about the importance of climate change in driving these observed changes in malaria distribution and transmission in highland regions (IPCC 2007; Chaves and Koenraadt 2010). A recent review by Chaves and Koenraadt (2010) concludes that, even though the existing studies all applied different modelling approaches and techniques, they all show an association between malaria and climate variables, making the linkage between climate change and malaria in the highlands of Africa rather robust. In the same publication they argue, however, that overemphasising the role of climate as the autonomous main driver of highland malaria does not account for the clear multi-factorial causality of disease transmission.

The East African highlands are among the most populated regions in Africa, and their population growth rates are among the highest in the world. The regions are also faced with high rates of poverty. Poverty and demographic pressures have spurred massive land-use and land-cover changes (including massive deforestation) for agricultural purposes (Himeidan and Kweka 2012). The upland communities are often remote from regional health centres, and health services are patchy, hampering the surveillance and control of malaria. It is increasingly acknowledged that the risk of highland malaria moving to higher altitudes depends on the interplay between climate change and factors like land-use change, population growth, population movement, agricultural practice (e.g., pesticide use, irrigation systems), cessation of malaria control activities, drug resistance, limited immunity of people living at higher altitudes, and socio-economic status. Additionally, malaria invasion of the East African highlands has been associated with the migration of people from the lower areas to the higher altitudes (Lindsay and Martens 1998), introducing the malaria parasite into highland regions. Furthermore, the massive deforestation in East Africa has proved to be associated with changes in the local climate. As such, land-use changes and global warming may act together in causing the observed regional change in the local climate of the East African highlands (Himeidan and Kweka 2012). Changes in crop choice can also play a role, as demonstrated by the invasion of malaria in the Bure highlands of Ethiopia due to the fact that the mosquito vector thrived on maize pollen, just shortly after this crop was introduced (Ye-Ebiyo, Pollcak et al. 2000; Kebede, McCann et al. 2005). Irrigation activities and forest clearing have been associated with increases in vector densities, as they increase the number of mosquito breeding sites (Himeidan and Kweka 2012). Susceptibility to the increasing mosquito densities and the associated malaria risk are further complicated by the high poverty rates in the East African highlands. Fortunately, malaria prevalence in the highlands has decreased since the early 2000s, due to ongoing malaria interventions (Chaves and Koenraadt 2010; Stern, Gething et al. 2011; Himeidan and Kweka 2012). However, the sustainability of these interventions is questionable (Himeidan and Kweka 2012). African countries mostly rely on external donors, and global funding levels for malaria are in an increasingly precarious state (Pigott, Atun et al. 2012); weakening of malaria control programmes has been an important driver of malaria resurgence observed in the past (Cohen, Smith et al. 2012).

As Berrang-Ford et al. (2009) state, "climate change is one of several determinants of infectious disease occurrence, whose impact is superimposed upon, and moderated by, parallel changes in non-climate determinants." A recent report by the Africa Initiative (Tesi 2011) also stressed the multi-causality of malaria; although climate change has been associated with the emergence of malaria in African highlands, other factors are also involved in accelerating this process. The report argues that climate factors (increases in temperature, rainfall, and humidity) act as primary factors, because as long as the disease transmission is constrained by climate factors, the disease will automatically be limited as well. The secondary factors, such as drug resistance, agricultural development, population growth, migration, conflicts, and land-use change, can accelerate the process set in motion by climatic factors. Similarly, Chaves and Koenraadt (2010) emphasise that "a multidimensional array of underlying factors is likely to be at play here, most of which may be sensitive to climatic change." Hence, although climate change is believed to primarily affect the intrinsic malaria transmission potential (Tesi 2011; Cohen, Smith et al. 2012), it interacts with other factors and developments that also affect disease dynamics. Most of them, such as agriculture, food security, migration, and poverty, are expected to be affected by climate change (IPCC 2007; McMichael, Barnett et al. 2012).

Using the framework by Huynen et al. (Huynen, Martens et al. 2005; Huynen 2008), Table 4.1 illustrates the wide array of interacting factors that determine a population's vulnerability context within the wider climate-malaria system.

Table 4.1 Emergence of highland Malaria in Africa: examples of important system variables

Causal level of health determination	Institutional	Economic	Socio-cultural	Environmental
Contextual determinants (upstream macro-level conditions shaping the distal and proximate health determinants*	Public health infrastructure, including number of healthcare centres in highland areas	Economic infrastructure	High population growth and density resulting in demographic pressures	Climate change, ecosystem change
Distal determinants (are set further back in the causal chain and act via intermediate causes)	Health policy including efforts to reduce malaria, agricultural policies	Slow economic development, agricultural sector developments	Population movement, high poverty rates	Substantial land use/cover change, agricultural irrigation, altered local climate regulation
Proximate determinants (act directly to cause disease or health gains)	Pre-2000: lack of health care (or access to it) and control/ surveillance activities Post-2000: increasing malaria interventions and control	-	Lack of immunity to malaria in highlands, incorrect use of antibiotics or bed nets, drug resistance	Changes in local climate including temperature rise, increase in mosquito breeding sites

* i.e. they form the context within which the distal and proximate factors operate and develop

4.3 Systems approach toward vulnerability and adaptation

We argue that vulnerability to climate change impacts should be seen within the broader system of health determination, including many non-climate factors. The interactions between climate and non-climate factors are of vital importance in shaping human vulnerability to global warming. Although this chapter focuses on the example of highland malaria risk in Africa, the need for a systems approach is equally valid for other health impacts (e.g. food security, heat waves, flooding, health impacts related to water scarcity) (Huynen, Martens et al. 2013). In line with the above, the recent IPCC fifth assessment report (IPCC 2014) argues that future trends in social and economic development are critically important to vulnerability.

In view of their particular vulnerability context, the health effects of climate change are expected to be especially harsh in the developing countries. This is not only due to differential exposure to the hazard, but also to the interactions between climate and non-climate factors that fundamentally shape the high vulnerability of developing countries' populations to the anticipated health impacts. Developing countries are, for example, more reliant on agriculture, more vulnerable to droughts, and have a lower adaptive capacity (USGCRP 2008). The IPCC (IPCC 2014) concludes, however, that that there have been comparatively few studies of vulnerability among low- and-middle income populations, or of more complex disease pathways. Additionally, efforts to mainstream climate change adaptation into development planning in order to reduce local vulnerabilities are still at a relatively early stage in many countries (UNDP and UNEP 2011).

In order to avoid a multiplication of health risks in the developing world, there is a need to better understand the multi-faceted and complex linkages involved. We need to move away from the discussion about the relative importance of climate change to other stressors, towards approaches that take possible synergies between different developments into account. This chapter demonstrates that an effective response to climate change related health risks should take a systems approach towards adaptation, acknowledging the importance of the local context of the most vulnerable. Hence, adaptation measures have to be specific for the local context, seeking to address the causes of higher vulnerability and lower adaptive capacity by focussing on measures to reduce poverty and other non-climatic factors that make people vulnerable. Without efforts to improve our understanding of this system and subsequent action to protect the most vulnerable, the amplification of existing and emerging health risks might become the greatest tragedy resulting from climate change (Huynen, Martens et al. 2013).

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Part III
Sustainable development research at ICIS: the socio-economic dimension

Chapter 5

Sustainable development as a guiding principle? Limburg, the Netherlands, as a case study[2]

Annemarie van Zeijl-Rozema

[2] This chapter is based on PhD work previously published in Van Zeijl-Rozema, 2011.

Abstract

This chapter explores the question what makes it so difficult to realise sustainable development, and aims to identify some strategies to promote the implementation of sustainable development. The topic was studied by conducting a regional survey in the Dutch province of Limburg. More than 900 people responded. Our hypothesis was that the general public might have a limited understanding of the consequences of sustainable development, which could act as a barrier to action. At the same time, we hypothesised that people might be “doing” sustainable development without knowing it, which would make a transition towards sustainable development an issue more of labelling than of behavioural change. We investigated people’s awareness and understanding of sustainable development, as well as their perception of their own sustainability, their willingness to become more sustainable and finally the current level of sustainable considerations regarding goods and services. The results were used to derive several pathways for action.

5.1 Introduction

In studies into the implementation of sustainable development, there is often a discrepancy between what people say they want to do and their actual behaviour (e.g. Claudy, Peterson et al. 2013; Beumer 2014; Vasseur 2014). In a recent study in the Dutch province of Limburg, 83% of people said they had included sustainable development in their lives, and 90% of the people wanted to become even more sustainable in the future.

But what do people actually mean when they say they have included sustainable development in their lives, and to what extent is sustainable development a part of the choices they make in their lives? If these issues are understood in more detail, this might provide policy makers with some levers for influencing behaviour towards sustainability. In order to find out more about this topic, a region survey was conducted in the Dutch province of Limburg. More than 900 people responded. Information was obtained about the respondents' level of awareness and understanding of sustainable development, the extent to which their behaviour was sustainable, and their opinion about sustainable development.

Sustainable development is a complex concept, involving different temporal and spatial scales and multiple stakeholders (Martens 2006). It refers to a societal process of changes whose development goal is not clearly outlined and is subject to changes throughout the process. Fostering processes of sustainable development requires a pluralistic approach that can deal with multiple actors and multiple levels, and that is able to help create a shared vision of sustainable development and resolve trade-offs (Zeijl-Rozema van, Cörvers et al. 2008). The concept of sustainable development requires the planet and our world to be seen as a system, a system that connects space ("here and there") and time ("now and later") (IISD 2007). Simultaneously, sustainable development can be seen as a political or normative act, rather than a scientific concept. After all, sustainable development is about the quality of life that is desired now and in the future. Sustainable development is about making choices and trade-offs visible within the context of our desired future. This desired future will differ from place to place and from person to person. Hence, visions of a sustainable society may differ, not only between places, but also for the same place over time.

In view of its integrated nature and the related complexity, achieving sustainable development is not easy. This chapter explores the question what makes it so difficult to realise sustainable development and aims to identify some strategies to promote the implementation of sustainable development.

5.2 Sustainable behaviour

Given the fact that sustainable development is a normative concept and means different things to different people, it is not easy to define it. However, the above-mentioned characteristics might give some clues. The essential characteristics are that sustainable development is about resolving trade-offs within the context of the desired future, and that it requires a systemic view of the world and of the impact of human actions on the world. Discussions of sustainable development often use the domains or capitals model, where sustainable development is seen as a balanced representation of the social, environmental, and economic domains (e.g. Elkington 1997). Governance is a way to organise these domains. It would then be plausible to say that sustainable behaviour is about ensuring that one's choices do not compromise this balance between the domains (see Figure 5.1).

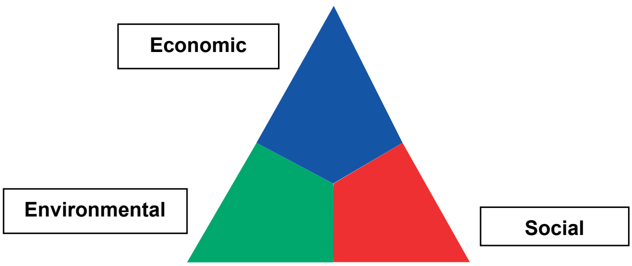

Figure 5.1 A balanced picture of sustainability

The actions people take in their lives all have implications for sustainability. Social practices theory is already being used to understand and explain unsustainable consumption levels (Kuijer 2014), which is why it is also used here to identify determinants of sustainable behaviour. In particular, we use the model by Spaargaren (2003), which distinguishes four social practices: leisure, consumption, mobility, and dwelling. For each of these practices, people make (conscious or unconscious) choices. In our study, people were asked about their considerations when making choices in these various categories, the assumption being that sustainable behaviour would be behaviour that balances the domains.

5.3 Familiarity with sustainable development

Respondents were asked whether they were familiar with the concept of sustainable development, what issues they could think of, what description of the concept fitted best and how important sustainable development was to them. Those who were familiar with sustainable development prior to the survey (72%) interpreted it as a balanced development of society, the economy, and the environment. However, when asked about concrete actions that are part of sustainable development, they mainly chose environmental issues, while social and time-related issues were also often mentioned.

It can be concluded that sustainable development is relatively well-known and is understood in its broader sense at an abstract level as a balance between the domains of people, planet, and profit. Furthermore, 78% of all respondents indicated that sustainable development was important to them (see Figure 5.2).

Figure 5.2 How important is sustainable development for you?

However, when confronted with a number of concrete topics that are part of sustainable development[3], 99% of the respondents interpreted sustainable development mainly as environmental issues (see Figure 5.3). This implies an important lesson: familiarity with sustainable development exists only at an abstract level. At a concrete level, environmental awareness is mainstream, but sustainable development is not.

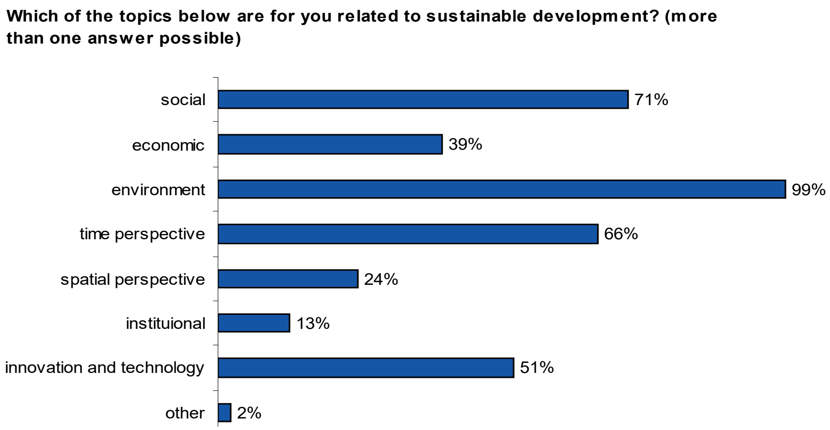

Figure 5.3 Topics related to sustainable development

[3] Combating child labour, attention to climate change, local products, social cohesion, economic growth, care for the environment, waste separation, quality of governance, renewable energy, vegetarian diet, combating poverty, clean air, conscious choices, developing countries, health, short-term, future, innovation, nature, happiness, other.

Attempts to convert these findings into action should focus especially on the fact that people who are already aware of sustainable development score significantly higher in terms of sustainable actions. This leads to the conclusion that awareness plays a part in sustainable behaviour, especially regarding concrete examples of what sustainable development can mean at home, at work, and at school.

5.4 How sustainably do people act?

While the previous section looked at how people see themselves in terms of sustainability, this section investigates the actual behaviour of the Limburg population. Respondents were asked about their behaviour regarding mobility and their criteria for deciding on the procurement of goods and services. Sustainable behaviour would mean people basing their considerations on social, economic, and environmental criteria. But first of all, they were asked if they would like to live a more sustainable life in the future (see Figure 5.4).

Figure 5.4 Becoming more sustainable

The majority of respondents say they did want to live more sustainably if there was a clear effect or if there was clear information on sustainable development (36%). This is followed by a group of people who said that they would like to live more sustainably provided it did not take more money or effort (29%). Next is the group who said that they would like to live more sustainable even if it cost more or took more effort (20%).

The following observations can be made. First, many respondents said living sustainably should not require more time or money. This means people are willing to change if it is easy. Unfortunately, easy change is not often possible. Nevertheless, this finding is an indication that easy options are required if people are to become more sustainable.

Secondly, people want to know the benefits to themselves. Apparently it is not clear how sustainable development will provide individual benefits. This might be related to the long time-frame of sustainable development and its inherent focus on the “greater good”.

Related to this is a third point, viz. that people want to be more sustainable if it has a clear effect, which seems a broader issue, including both themselves and society. The effects of sustainable behaviour should be made clear, which is where monitoring becomes important. However, the long time-frame for sustainable development and its associated low visibility might again be a problem. A solution might lie in participatory monitoring, which gives citizens a role in monitoring.

The fourth point is that there is a group of people who will follow the mainstream. However, we found that sustainable development is not mainstream, so efforts should focus on improving this. And lastly, there is the issue of people who indicate they only will act sustainably if they are forced to. Here one could think of regulations, financial incentives, and banning unsustainable products and services.

Now that we have shed some light on people's willingness to become more sustainable, it is time to look at their actual behaviour.

Mobility

Mobility is an important aspect of sustainable development. On the one hand, people's perception of quality of life depends on their freedom to travel, while on the other hand, car use and other means of transport impose a large burden on the environment. Also, mobility is something that concerns everybody on a daily basis. Respondents were asked about their home situation regarding mobility and how they went to work and/or school, to assess how sustainably they acted.

Fifty-eight percent of the households in Limburg own at least one car, and the majority of households drive between 10,000 and 50,000 km a year. People often use the car for short-distance trips around their homes, visiting family and friends, which shows that this will need to be one of the focal points of campaigns. One could think of stimulating alternatives for near-home car use by improving neighbourhood taxi services and delivery services. For day trips, accessibility of main railway and long-distance bus connections could be improved to stimulate longer-distance travel by public transport, and car-pooling and car-sharing facilities could also be improved (see Figure 5.5).

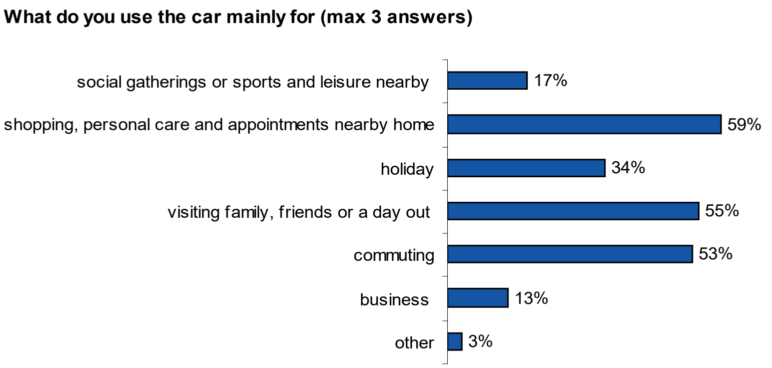

Figure 5.5 Car use

People also frequently use the car for commuting to work or school. Some interesting results were found when comparing the answers from work commuters with those of school commuters. Travelling to school involves more muscle power and public transport than private motor transport, whereas private motorised transport is the most important means used to get to work. Apparently, once people start working they partly stop using the bicycle or public transport, and use their private car (see Table 5.1). Indeed, 20% of the students among our respondents (who were mainly in the under-25 age group) mentioned that their reason for choosing a particular type of transport is that they do not have a driving licence (yet). This is a group that might change to private motorised transport as soon as they obtain a licence.

Table 5.1 Most important means of transport for work and school

	Work	School[4]
Own muscle power	31%	47%
Private motor transport	62%	21%
Public transport	7%	25%

The reasons for choosing a particular type of transport are mainly that it is fast and easy. Not surprisingly, an important reason for students is the cost (3rd place). However, for those in work, the costs come 5th and the location of their work is a more important factor in choosing their means of transport (see Table 5.2). Of course, there are many other factors also related to the decision to opt for a particular type of mobility. For instance, respondents indicated that speed and accessibility are important factors for them in choosing a transport type for commuting. Alternatives to private motor transport should thus offer speed and flexibility.

Table 5.2 Top-3 reasons for choosing a particular means of transport

	Work	School
Fast	1 (47%)	1 (46%)
Easy	2 (45%)	2 (43%)
Cheap	5th place (22%)	3 (38%)
Necessary because of location	3 (31%)	5th place (22%)

The distance also plays a role in the type of transport chosen. The longer the distance travelled, the greater the shift from muscle power to motor power. Thirty minutes of commuting seems to be the average. However, there seems to be a gap at 5–10 km: this distance seems too great for people to rely on muscle power, and too short to take the bus or train. Instead, they use private motor transport, although cycling could still

[4] The 8% unaccounted for is the “other” category, which represents mainly those students who live at home and do not need transport.

be an option. E-bikes and improved public transport services could be an answer to this issue. Finally, incentive schemes for environmentally friendly transport are not in place everywhere. Stimulation of environmentally friendly transport is done by public organisations and large organisations, but much less by others. These other employers and schools (especially small and medium-sized organisations) could be stimulated to set up incentive schemes and creative mobility solutions.

An important conclusion regarding mobility is that care for the environment is not an important consideration in choosing the means of mobility. This means that other strategies are needed that can make mobility more sustainable. Social issues of mobility were not taken into account, apart from the considerations for buying a car discussed below.

Sustainability considerations at home and at work

This section discusses which choices people make in their daily lives (at home and at work), in order to see how sustainable they are. Activities that were targeted for the domestic situation included issues such as shopping for food, buying a car, and choosing a holiday destination. The questions asked on this topic in the questionnaire were designed with Spaargaren's social practices model in mind (Spaargaren 2003). Using this model, the results were grouped into activities regarding Leisure, Consumption, Mobility, and Dwelling. Mobility has been extensively covered in the previous section and does not feature here. Possible considerations were derived from corporate social responsibility criteria (MVO Platform 2007), in addition to considerations of cost and quality, and grouped into the categories of social considerations (working conditions and trade relations at producers side), economic considerations (costs), environmental considerations (environmental pressure), quality consideration, and any other considerations. The results are divided into two parts: home and work. Table 5.3 shows how the two situations can be compared.

Table 5.3 Activities at home and at work

Home	Work
Leisure	**Not relevant**
Choosing a sports club	
Choosing a holiday destination	
Consumption	Production process and consumption
Shopping for food	Procurement of services
Buying clothes	Procurement of raw materials
Buying electrical appliances	Procurement of electrical appliances
Choosing an energy company	Procurement of energy
Buying a car	Procurement of catering
	Procurement of company vehicles
Mobility	Mobility
Previous section	Previous section
Dwelling	Using the office building
Separating waste	Waste management
Repairs and renovations	Repairs and renovations
Decorating a house	Decorating the office
Building a house	Building an office building
Designing a house	Designing an office building

Home

The activities that were conducted most often in the respondents' households in the 6 months preceding the survey were shopping for food, buying clothes, separating waste, doing repairs or renovation, and buying electrical appliances (see Figure 5.6), which belong to the Consumption and Dwelling categories.

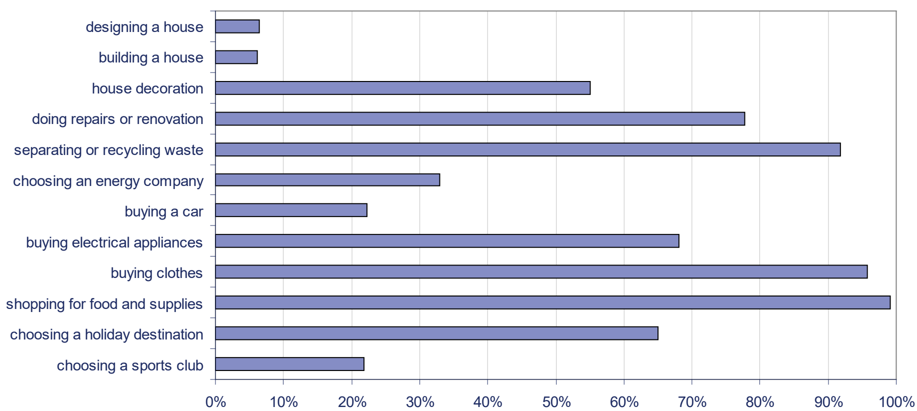

Figure 5.6 Activities in households in the 6 months before the survey

Economic and quality considerations were always among the two most important considerations mentioned, with two exceptions: when choosing an energy company, environmental considerations took second place, after economic considerations, and when separating waste, environmental considerations greatly prevailed over the second highest, economic considerations; for an example see Figure 5.7. Social and environmental considerations, two important pillars of sustainable development, are slightly important only when buying a car (environmental considerations), and when designing and building a house (social considerations).

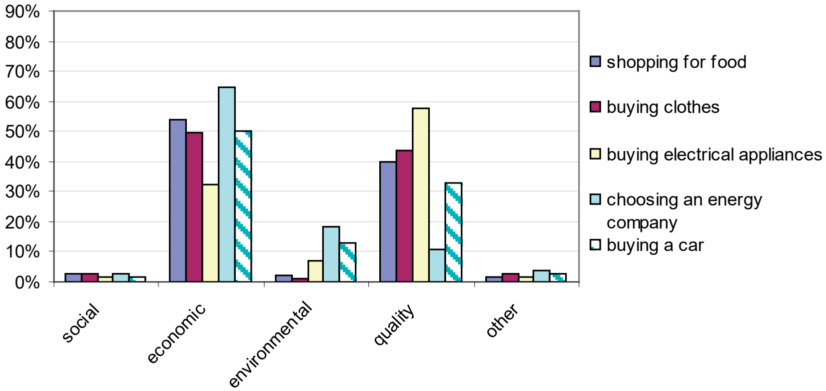

Figure 5.7 The most important considerations[5] for consumption

Work

The work situation generally shows similar trends as the home situation (see Figure 5.8 for an example). Cost and quality are the most important considerations.

[5] Social considerations: labour conditions of producer or service provider (e.g. child labour, security of personnel, sufficient wages for “survival/subsistence”) and procurement and trade conditions of producer or service provider (e.g. profit sharing for employees, fair contracts, “misusing” a dominant market position). Economic considerations: cost of the product or service. Environmental considerations: environmental pressure of the product or service. Quality considerations: quality of the product or service.

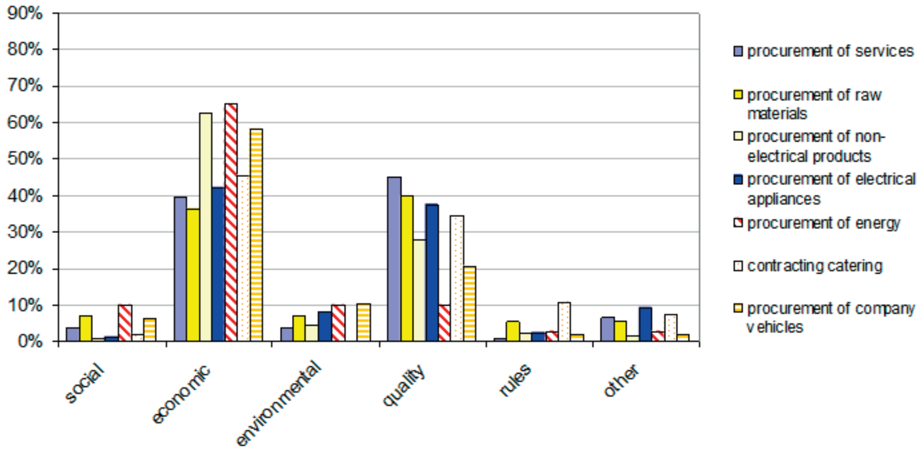

Figure 5.8 Most important considerations[5] for the production process and for consumption

The environment plays a role in waste management, procurement of company vehicles and procurement of energy, while social considerations play a role in the procurement of energy only. Company size is relevant for certain behaviours and awareness, e.g. small organisations do less for sustainable development than big ones, and would need special attention.

Unbalanced

Because environmental and social considerations are of minor importance, a very unbalanced picture of behaviour emerges, from a sustainable development perspective (see Figure 5.9). In fact, it was difficult to observe sustainable behaviour in the topics that were analysed, despite the fact that many people said they were living sustainably.

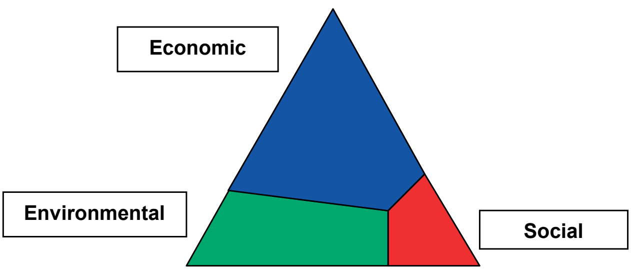

Figure 5.9 An unbalanced picture of sustainability

Given the fact that environmental considerations play such a small role, it can even be concluded that the environment is not a mainstream topic, which is in strong contrast with the above conclusion that environmental awareness is mainstream. However, this can be explained by the above-mentioned gap between awareness and behaviour.

Just as in mobility behaviour, no sustainable actions were observed at home or at work. In this respect it is also important to note that economy-related issues scored rather low on what people think sustainable development is about, implying that the economy is not seen as an important part of sustainable development, although it is a very important consideration when procuring goods or services.

5.5 Pathways for action

This chapter aimed has examined the knowledge and behaviour of the Limburg population regarding sustainable development, in order to identify pathways for action. The hypothesis was that the public might have a limited understanding of the consequences of sustainable development, and that this would constitute a barrier to action. At the same time, we thought that people might be “doing” sustainable development without knowing it, which would make a transition towards sustainable development an issue more of labelling than of behavioural change.

Awareness

Regarding the understanding of the consequences of sustainable development, the survey showed that people think sustainable development is important. They understand sustainable development at an abstract level, but there is limited understanding of sustainable development at the level of concrete actions, and at a concrete level it is mostly interpreted as relating to the environment. The economy is not seen as a significant dimension of sustainable development. Those who are more aware of sustainable development are significantly more likely act sustainably. However, it has become clear that people have received very little information on sustainable development.

With respect to action, first of all, it is clear that the public need to be better informed about sustainable development. Indeed, people have not received a great deal of information on sustainable development, and thus one could argue that ignorance is a possible cause of unsustainable behaviour. More specifically, people need to know about the interrelatedness between the social, environmental, and economical domains and between time and space, and the impact of their actions. Furthermore, they need examples of concrete actions they can take. Options for action include information and awareness campaigns at school, at work, in the supermarket, in shopping streets. Another option would be to provide people with product information on sustainable development.

Behaviour

Regarding sustainable behaviour, our survey found that people say they are sustainable and want to become even more sustainable, but this should not take more time or money, and individual benefits and effects of sustainable behaviour should be clear. Sustainable behaviour was not observed, and people do not act sustainably (yet), nor do they know what they can do. Their behaviour is mainly driven by quality and cost considerations.

Actions to improve sustainable behaviour could address a variety of issues. The first is to make the sustainable option the easiest option, though with acceptable quality and cost. Other actions include providing product information, helping people to determine the sustainability of their actions, and offering alternative mobility solutions that ensure speed and accessibility. The bottom line is that people should not be bothered too much with having to decide what is sustainable and what is not.

Furthermore, an enabling environment can be created to promote these changes. Because sustainable development is such a long-term process, government seems to be ideally placed to coordinate the creation of an enabling environment that allows markets and civil society to act and that safeguards the road towards a sustainable future by means of (participatory) monitoring and keeping track of deviations from the overall goals. Monitoring will also meet the expressed need to know the effects of one’s individual actions on sustainability.

From abstract to concrete

It is important to note that the proposed actions are interrelated and mutually reinforcing, and therefore should be addressed in parallel. Also, different groups need different approaches: there are differences in activities and in criteria for decision-making with respect to age, gender, education, and awareness, as well as company size.

The complexity of sustainable development makes it impossible to judge precisely what harm or benefit will result from one’s actions. However, analyses such as the above help to move from the intangible abstract level of interconnectedness to the more concrete practical level of taking action.

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Chapter 6

The dual challenge of sustainability transitions[6]

René Kemp and Harro van Lente

[6] A condensed version of the chapter has been published in *Environmental Innovation and Societal Transitions*, 2011, pp. 121–124

Abstract

In this chapter we argue that sustainability transitions include two challenges: on the one hand achieving a long-term change to various technologies and infrastructures, while on the other hand ensuring that values and consumer criteria change simultaneously. Transitions that fail to do so will disappoint in the end. We review two sustainability-oriented transitions where criteria have changed: the hygienic transition around 1900 and the waste management transitions at the end of the twentieth century. While in these cases people's values, perceptions, and criteria changed as part of the transition, this does not seem to apply to sustainable mobility and energy, where the main target is decarbonisation. What is missing is a reconsideration of individual mobility and energy use.

6.1 Introduction

The notion of transitions (Geels, 2002, 2005, Grin et al., 2010) has emerged as a theoretical response to major socio-economic challenges including depletion of natural resources and global warming. The idea is that systems of transport, agriculture, and energy have to be superseded by other systems. Such sweeping transitions have occurred in the past, for instance in the shift from sailing boats to steam ships in the nineteenth century (Geels, 2002) or the change from coal to natural gas in the Netherlands in the 1960s (Rotmans et al., 2001). And thus, the argument goes, they may happen again.

Such systemic changes have been studied by evolutionary researchers, historians, and scholars in the fields of science, technology, and society. Frameworks such as the multi-level perspective (Geels, 2002, 2005) and strategic niche management (Kemp et al., 1998) highlight both the persistence of incumbent regimes and their vulnerability. The general message is that it is possible – based on an understanding of the systemic and dynamic properties of existing and emerging systems – to guide or actively encourage a transition from the current to a new system. Doing so is a major challenge, however, that goes well beyond the capability of governments and individual actors.

In this chapter we argue that sustainability adds an additional challenge. The idea of sustainability transitions not only includes the challenge of orchestrating a *change of system* (transport, agriculture, energy) but also *a change in the criteria* that actors use to judge the appropriateness of products, services, and systems. In the transition from sailing ships to steam ships fuelled by coal, for instance, the criteria for choosing ships did not change dramatically. Both types of ship competed in terms of tonnage, reliability, and speed, as sailing ships had done for decades or even centuries. In the transition from coal to gas, the basic aspects on which technologies had to compete did not change dramatically either, in terms of price, ease, and reliability.

For sustainability transitions to occur, however, criteria need to change dramatically, or transitions run the risk of not being sustainable due to rebound effects and other impacts. For instance, the transition from combustion engines to electric vehicles, which is now being intensively studied, will only be sustainable when not only the nature of the vehicles changes (powered by fossil fuel or electricity, respectively), but also the way in which they are used. In other words, the values and practices of mobility need to change as well. Today's cars are bought on the basis of speed, range, reliability, and "image". In our society it is normal to own a car and use a car for almost every trip. Looking at alternatives, electric vehicles address two problems that stem from the intensive use of cars (noise and pollution), but they do not address problems of congestion and safety, while the intensive use of electricity and batteries raises additional problems. Moreover, an unanticipated effect of the development of batteries for cars is their use in bicycles. Unless electric bicycles are used for longer trips that are currently made by cars, this represents a negative development, especially if the bicycles are used to make additional trips. Therefore the assumption of individual, material-intensive mobility as well as the need for mobility has to be reframed.

6.2 The hygienic and waste management transitions

Two socio-technical transitions, in which criteria changed dramatically, bringing society closer to sustainability goals, were the *hygienic transition* and the *waste management transition*, described in Geels and Kemp (2007). The hygienic transition concerned a shift from cesspools to integrated sewer systems, motivated by hygienic concerns. In the Netherlands, the transition occurred over a period of 60 years (1870–1930). In the absence of toilets, most people relieved their bowels in public spaces, dumping urine and excrement on streets and (city) canals. The middle and upper classes had personal in-house privies, where excrement was collected in cesspools that were emptied a few times a year to serve as fertiliser. The transition which involved major health and nuisance benefits was a slow process. Unlike in the UK, Germany, and France, the sewer option was not used in the Netherlands before 1893, because of a battle between different systems (with sewers competing against a barrel-collection system and the Liernur pneumatic system). In 1938, 47% of all municipalities in the Netherlands had sewers. Comfort and convenience were important drivers, as were the new criteria for public hygiene. Costs at first impeded the introduction of the sewer system, but with growing affluence this became less and less of an obstacle. It was not an easy or obvious transition. Today some criticise the sewer system on environmental grounds for using drinking water to flush toilets and for the high energy consumption in waste-water treatment.

The story of the transition in waste management from 1970 to 2000 also shows a change in values, practices, and criteria that define what "waste" is and how it should be handled.[7] Before 1970, waste management consisted primarily of landfilling, a task carried out by municipal authorities. Getting rid of waste was the primary concern, with waste material also being used to fill up ditches and create land for housing. This changed in the 1970s: waste and the absence of good waste management practices received increasing attention. Environmentalists criticised governments and business about the way waste was being managed, while local resistance to new landfill sites grew. The 1972 Report to the Club of Rome about limits to growth, together with the oil crisis in 1973, drew attention to the scarcity of raw materials. The important change that we should emphasise is that waste disposal was increasingly seen as a problem

[7] In Geels and Kemp (2007), the change in waste management system is referred to as a transformation instead of a transition. In Geels and Schot (2007), a transformation is a special type of transition, one in which regime actors respond to landscape pressures by *modifying the direction* of development paths and innovation activities. Gradually a new system grows out of the old one, through cumulative adjustments in a new direction.

instead of as a solution. Special legislation for waste was developed and provincial authorities were charged with putting an end to the (uncontrolled) dumping in landfills and to benefit from economies of scale for incineration. An important cognitive institution was the famous “waste hierarchy” proposed in the parliamentary motion brought forward by Ad Lansink in 1979, known as Lansink’s Ladder. The waste management hierarchy ranged from prevention, through re-use (of products), recycling (of materials) and incineration (with energy production) to landfilling as the last option.

The new criteria for waste were further consolidated when the Dutch government opted for a *differentiated waste-stream* approach in which certain types of waste (notably paper and glass) were singled out for recycling. Despite these intentions for upgrading waste practices, many waste management activities only occurred at a small scale and did not result in effective environmental protection. Concerns about non-sustainable waste management did not disappear and reached a peak in the 1980s, following the discovery of leaking landfills (Vogelmeerpolder) and contaminated land (Lekkerkerk and Griftpark). Waste scandals often figured as news items in the 1980s. At the end of the 1980s, the Dutch waste management system was in a state of crisis because of capacity problems stemming from growing quantities of waste and reduced capacity. The system was reviewed by a specially created committee (the Landelijke Coördinatie Commissie Afvalbeleid) which concluded that the current organisational structure was too fragmented, dispersed, and small-scale. It argued for the creation of a national organisation to oversee and manage waste volumes and to keep disposal costs under control. Their advice resulted in the creation of four waste regions and the Waste Management Council (AOO), which would play an important role in the modernisation of the waste system.

Thanks to a range of measures (such as the ban on 32 waste streams for landfilling, a packaging covenant, and higher tariffs for landfilling), the amount of waste being landfilled fell from 14 million tons in 1990 to 5 Mton in 2002 (a total reduction of 9 Mton). Today, all landfills have advanced systems of soil protection and methane extraction systems. In the same period, the incineration capacity increased gradually, from 2.2 Mton in 1980 to 4.9 Mton in 2000. Recycling increased from 23.5 Mton to 45.3 Mton between 1985 and 2000. Also the total number of landfill sites decreased significantly the last decades (see Figure 6.1 and 6.2).

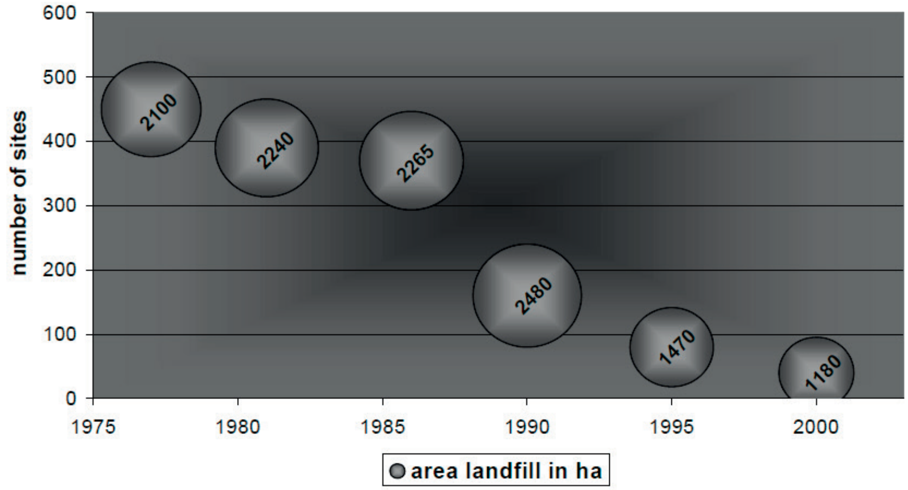

Figure 6.1 Reduction of landfill in The Netherlands (Source: AOO)

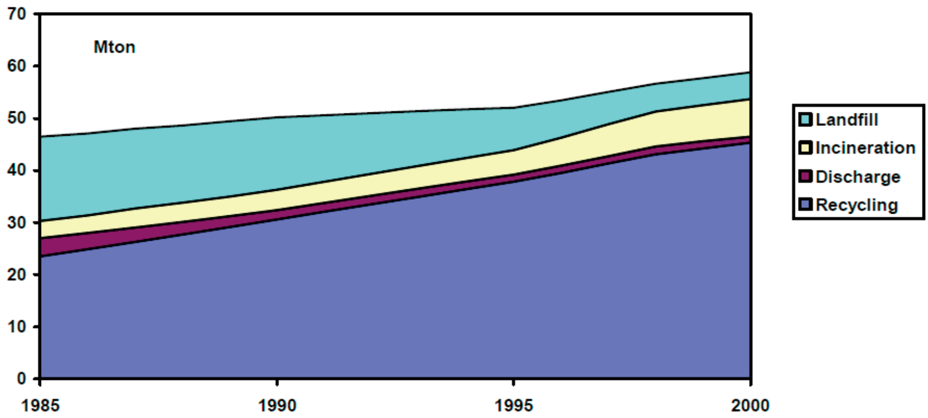

Figure 6.2 Changes in waste management in The Netherlands (Source: AOO)

The transformation of the waste management system is often viewed as the result of policy. Such a view, although not "wrong" per se, overlooks how policy itself was the result of various changes: the growing volumes of waste, the waste scandals in the 1980s and early 1990s, and, in particular, changes of perception, in which waste became "a waste of resources". In addition, the waste scandals helped to close down old incinerators and build better ones.

The AOO as an institution of governance played an important role in the transformation process. Negotiations between different tiers of government and with private waste companies took place within the AOO, with the actors agreeing on the general direction of creating a modern and efficient system of waste management with less waste being landfilled. Although officially opposed to incineration, the environmental movement did not focus on this aspect because they understood the bigger picture, i.e. the high costs of advanced systems of incineration necessitated a high tax on landfilling burnable waste, which encouraged waste prevention and recycling. The waste companies were happy with the larger scale at which they could operate. The reorganisation of the sector was seen as a blessing by the AOO, as major companies from North America, including Waste Management Inc. and BFI, took control of small companies. The large companies were committed to full compliance and had a strong incentive to respect the law.

In this transformation, new “sustainability” criteria were incorporated formally in law and informally in the waste management practices of companies and consumers separating their waste. The reorganisation of the waste market suited the interests of big waste companies, and environmentalists were happy with the incentives for prevention and recycling being created through laws and waste taxes negotiated within the AOO. However, the system did not manage to radically alter product features in terms of design for assembly and re-use. The final waste goal was therefore not achieved because of opposition from product manufacturers and because consumers did not seek products with second-life components.

6.3 Sustainability criteria for the transitions to sustainable mobility and energy, and the problems of introducing them

Compared to the hygiene and waste transitions, the transition to sustainable mobility and sustainable energy can be expected to be much more difficult because the systems for automobility and fossil-fuel based energy are much more deeply embedded. Both car mobility and cheap energy are viewed as basic rights. The criterion of affordability – so important for users and governments – conflicts with sustainability because affordable mobility and energy stimulate mobility and energy use. In this respect, the low operating costs of electric cars are an undesirable feature, as this will continue to foster mobility and energy use. Likewise, improved public transport may temporarily decrease the use of cars but can also be expected to stimulate mobility.

We argue that transitions that do not fundamentally change the criteria on which decisions are made are unlikely to lead to sustainability. In their famous article on the framework of evolutionary economics, Nelson and Winter (1977) coined the notion of “natural trajectories”, referring to long-term regularities like mechanisation in the 19th century or miniaturisation since the 1960s. Their argument is that while individual innovations will follow routines and heuristics (within firms), the general tendency of such innovations, e.g. to replace manual labour by machines, is more general, across firms and decades. Phrasing it like this enables us to delineate the natural trajectory of cars as an increase in volume, weight, and mileage. This has to change through a different appreciation of mobility.

The choice of criteria is best accompanied by visions of sustainability for mobility, food, energy use, housing construction, and other resource-using products and practices. A useful attempt to define sustainable mobility has been provided by David Banister in a prize-winning paper published in *Transport Review*. Sustainable mobility is based on the following elements: reasonable travel time rather than travel time minimisation, reducing the need to travel (through working from home), seeing transport as a valued activity rather than derived demand, achieving a modal shift (especially to walking and cycling), lower levels of pollution and noise from transport, greater energy efficiency, more efficient use of infrastructures (through higher vehicle occupancy and demand management), and increasing the quality of places and spaces (Banister, 2008). Some of the elements are already being used by transport experts and authorities, while others are not. It is difficult to ban car use and create space for other modes of transport, because such changes meet with opposition from car drivers and shop owners. A second problem is that the principles have to be applied for a long period to really take effect..

The need for policies that are unpopular with consumers brings us to another theme, which is effective governance in a consumer society. In the 19th century, choices about the remaking of society were largely put into the hands of engineers and politicians, who decided about needs and ways to meet them (for an illustrative analysis of public water supply proposals in Paris, see Graber, 2007). In a consumerist society, it is the consumer needs that dominate. The question then is: can we remake ourselves as part of a process of remaking society? Better technology does not produce better people, and it is wrong to expect too much from technology. There is a role for self-imposed constraints to reduce our impacts on the environment and others. This is the hardest element of the sustainability transition challenge. Efforts to facilitate sustainable mobility have to be reconciled with rival societal aspirations such as the pursuit of faster and more convenient forms of travel (Cohen, 2010, p. 459).

Politically, green values have been incorporated into every party programme, but green issues compete with other issues. There has been a call for eco-centred politics (Dobson, 1995) but green issues have not taken precedence over other issues, and are unlikely to do so. Green technologies benefit from ecological modernisation strategies, but green growth is simply another form of growth; what we need is an ethos of moderation based on restraint, respect, empathy, and self-actualisation. These are overarching criteria and values, making it easier to establish product-based criteria. The interaction effects of criteria are a topic of research within ICIS (being studied in the POLFREE and TRANSIT projects).

The overall conclusion is that sustainability has to be taken up in a more consistent way than at present. Catering to people’s desire for comfort, convenience, and low costs may not lead to sustainability transitions. In our view, sustainability transitions require that people accept constraints and are willing to live and behave differently. Transitions are always accompanied by changes in values and beliefs, as shown by the examples of hygiene and waste. Some elements fit in with sustainability, while other elements do not. Thus far, we do not see fundamental changes in values and beliefs in the case of mobility and energy. A change in criteria can occur through cultural change, prices, and new and better knowledge. The processes by which such changes occur is a topic for further analysis, and the aim of this chapter is to put this topic on the agenda of sustainability transitions research.

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Chapter 7

The curious case of needs and innovation

Harro van Lente

Abstract

This chapter investigates two precious ingredients of sustainable development: needs and innovation. Fulfilling needs is the touchstone of sustainability, while innovation is believed to be driven by needs. A closer inspection of technological change, however, shows that needs are not the starting point of innovation but the end result. That is, when technologies change, needs change too, and the chapter discusses how this confuses thinking about sustainability and innovation. A curious conversion occurs when innovators are successful: while innovators are expected to put great efforts into creating markets and needs, people do not explain the success of innovation by the efforts of innovators, but by the need itself. Needs are thus tautological here. The implication is that the question should not be to distinguish between "real" and "artificial" needs; the question should be which needs we can afford.

7.1 Introduction: the study of needs

The concepts of needs and sustainability have an intimate relationship. Needs figure prominently in the famous Brundtland (1987) definition of sustainable development: a "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."(UN WCED, p.45). Meeting needs is thus the touchstone in deciding whether a development is sustainable or not. Innovation is a well-appreciated route used to contribute to sustainable development and, at the same time, address needs. In this chapter, I investigate how needs and innovations are intertwined, I discuss how the touchstone of needs changes over time, and I conclude that needs and innovation are problematic and curious ingredients of sustainable development.

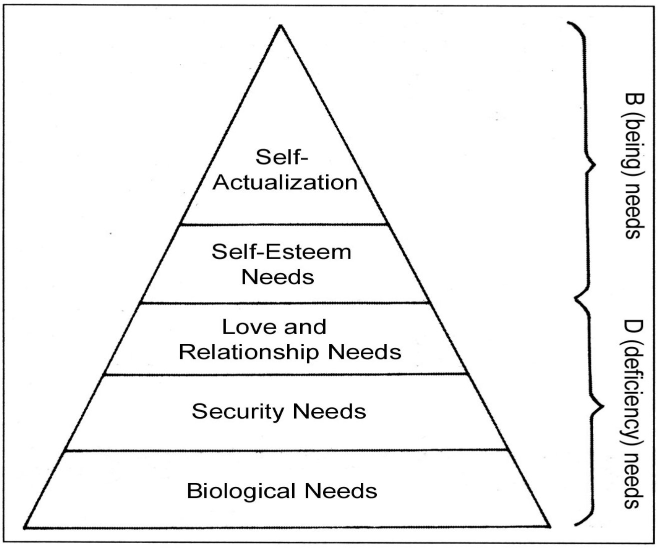

Figure 7.1 The famous hierarchy of needs, according Maslow 1943

The best-known classification of needs is the one proposed by Maslow (1943), who placed the need for self-actualisation at the top (see Figure 7.1). "What a man can be, he must be. This need we may call self-actualization [...] It refers to the desire for self-fulfilment, namely for one to become actualized in what one is potentially. This tendency might be phrased as the desire to become more and more what one is, to become everything that one is capable of becoming" (Maslow 1943, p. 383). The hierarchy seems plausible to some degree, but can be contested with many cases, say, a mountain climber who prioritises her need for self-actualisation over the need for safety. Needs have also been studied in other disciplines, in many different ways (see Table 7.1).

Table 7.1 Needs in research

discipline	discussion
psychology and biology:	layers of needs, Maslow, latent needs, needs and imitation, conspicuous consumption
anthropology:	needs in the fabric of social life
cultural studies:	relativistic accounts of needs
political philosophy and history:	distribution of needs, philosophy of needs, human rights and capabilities
economics:	"preferences" as a starting point, as intentional black box
innovation studies:	demand articulation, user–producer interaction

The literature provides examples of long discussions about the distinctions between "basic needs" and "non-basic needs", and on the distinction between needs and wants. (Rivers, 2008; Soper 2006), which are illustrated by Mahatma Gandhi's famous warning that the world provides enough for everyone's needs, but not for everyone's wants. Another recurrent theme is the idea that what is conceived of as needs depends on the historical period and the locality (Townsend, 1979). This relativism is contested by Doyal and Gough (1991) in their influential *Theory of Human Needs*, in which they seek to establish principles to define universal needs. The basis from which they start is the idea of participation in social life. Two notions follow from this: physical health and autonomy, both starting points for a minimum of participation in social life. The emphasis on objectivity of needs leads away not only from (cultural) relativism but also from the idea that needs are individual expressions.

Ytrehus (2001) made a distinction between (i) the positivist tradition, assuming the possibility to objectively measure needs, (ii) the market-oriented tradition, equalling needs with expressed preferences of economic agents, (iii) the cultural tradition, stressing the relativity of needs, and finally (iv) the universal standards tradition, which embeds needs in a broader understanding of social and cultural participation.

7.2 Tautological needs

Needs are thus contested but powerful concepts in the way we understand society and the challenges of sustainability. Instead of aiming for a final verdict on what needs really are and how we should account for them, I want to take a different approach to the matter. My starting point is that needs change and that the change is intimately related to innovation. According to popular belief, need is the mother of invention. The idea is that given the scarce resources and the unsatisfied needs, human ingenuity comes with appropriate and welcome solutions. Yet, historical studies of technical and societal change also show that needs are changeable: what is needed now is not the same as what was needed a century ago. So, while needs may be the mothers of innovation, needs have mothers as well, and one of them is innovation itself. When new offerings are planned, tested, and used, new needs will develop as well. This holds for technological systems, as Frédéric Graber (2007) has described in his case study of water supply in eighteenth- and nineteenth-century Paris. It also holds for individual purchases. Twenty years ago, for instance, I did not need a mobile phone. Today, I need a mobile phone – because people expect me to have one. And many manufacturers are more than happy to satisfy my need. Two hundred years ago, there was no need for cars because in the absence of this option, people had a very limited travel range. Today, it is not easy to live without a car and many manufacturers are happy to satisfy this need.

An innovation is thus accompanied by a new need. It is a well-understood lesson in business studies: without a new need, a new product or service will not survive. Peter Drucker (1954), one of the most influential authors on business, puts it like this: "There is one valid definition of business purpose: to create a customer" (p. 37). Business studies investigate how firms can be more or less successful in creating customers, that is, in creating the situation in which people purchase their goods or services. Clearly, this is not an easy task, requiring vision and stamina. Interestingly, when the task is successfully performed, the explanation makes a U-turn: it is no longer explained in terms of a firm being successful, but in terms of a mysterious other factor that somehow has entered the scene. This factor, identified as "need", or, to make it even more mysterious, "latent need", is now held responsible. It was not the firm, but the "latent need" that achieved the remarkable outcome of people purchasing goods and services! And how can we know that it was this "latent need" which achieved this? Well, the argument is that the "latent need" can be proven by the mere fact that people purchase the new goods and services. This is a circular argument, comparable to explaining thunder from a "thunder factor" and proving that such a factor exists by pointing to thunder itself. Logicians would call this a tautology.

Tautological needs are embedded in dominant ideas about the relation between humans and the goods they purchase. According to the German philosopher of technology Arnold Gehlen (1904-1976), humans differ from animals by their state of vulnerability and their needy condition. Since humans lack fur to warm their bodies, strength to defend themselves against predators, and speed to catch prey, the species *Homo sapiens* had to rely on technology: clothing, housing, weapons. Technology, then, is the extension of the body, an instrument, because humans have bodies with disabilities: they are "Mängelwesen". Clothing is the extension of the skin, the artificial fur, shovels are the extension of the arms, and knives the extension of teeth and claws. This instrumentalist vision of technology, although philosophically contested, is by now a well-established and common-sense notion. It fuels the self-image of engineers and provides justification for firms who come up with ever new products. When new technologies are sold and used, the argument is that firms just cater for the needs of humankind. And new technologies are then seen as yet another step towards the fulfilment of the needy condition of humans. The fact that they are used and recognised simply reinforces the initial assumption that they were needed in the first place.

7.3 Needs as end points of innovation

New technologies thus seem to be the next step in the ever continuing struggle of humans against nature. Yet, in socio-historical studies of technical change, another dynamic comes to the fore, emphasising the dramatic impact of new technologies. While innovations may bring new elements, they also disturb customary patterns and forms of life. The economist Joseph Schumpeter characterised the role of innovation in economic structures as “creative destruction”: building new opportunities while demolishing established industries. James Utterback’s *Mastering the Dynamics of Innovation* (1993) presents an overview of “waves” of innovation that have changed the face of an industry. Using examples such as televisions, typewriters, and flat glass, he demonstrates a particular pattern. In a first phase, various models abound and new firms compete on the basis of yet another model. Users are not sure what the new product is, how to use it, and what features would matter to them. In its first decade, for instance, the typewriter was seen as a strange intruder, occupying the no-man’s-land between printed text and personal letters. It is, as sociologists of technology would say, a monster, a hopeful monstrosity. Culturally and organisationally, such a newcomer is both disturbing and exciting. Criteria to judge its performance have not yet stabilised, so it is difficult to compare the various models. This is a period with a lot of product innovation and a lot of uncertainty about appropriate requirements – it is what Utterback labels the “fluid” phase. The period ends with the advent of a convergence in models and regularities of use and preference. Under such conditions a “dominant design” may evolve, which embodies the collective learning in terms of what the new product is and how to use it. At the other extreme, in a mature market, competition is no longer about models, but about cost and quality. In this “specific phase”, competition is dominated by economies of scale, and the number of competitors has fallen sharply.

The study of innovation also stresses that new products alone will not do the job. Celebrated innovators like Thomas Edison, Henri Ford, or Steve Jobs did not start working from signals of “need”, but from visions about a new system that could work, provided a mass market would buy the products and services. In his voluminous *Networks of Power*, the historian Thomas Hughes describes in detail the strategies Thomas Edison used to build new empires. “I have the right vision”, he said and sought ways to involve others in his plans: politicians, financiers, and consumers. George Eastman (1854-1932) had the vision to turn the delicate and difficult art of photography into a mass market. As one of the obstacles was the handling of glass plates and the employment of light-sensitive emulsions, he looked for alternatives and found celluloid, a sturdy, yet bendable new material. Celluloid made it possible to avoid plates and have a roll instead, inside a box that only the manufacturer needed to open. The customer could simply use the camera and when the box was full, return it to the manufacturer, who would develop the photos and return the box with a new roll. “You push the button, we do the rest”. He gave his products the brand name Kodak, and became the world leader in photography for almost a century, until it was overtaken by the next wave of innovation: digital photography.

According to innovation studies, new products need new markets, and big firms indeed tend to spend as much on marketing as on R&D. The sociology of expectations takes us one step further, into another, contrasting account of technological change (Van Lente 2012, Borup e.a. 2006). It is on the basis of circulating and shared expectations that researchers, technologists, and firms decide what options to take and what routes to follow. The central idea here is that progress is a given, and that engineers and firms are keen to discern the “next step”. So, when a new option is seen as promising, its priority will rise and it will figure on the research or company agenda. And when this is the case, further development is mandatory. The promise will then be used as a guideline and even as a measuring stick to assess the strategy and progress of research and development. Hence, the promise has been transformed into a requirement. It is not a matter of pre-defined problems or articulated needs, but a matter of ongoing technical change driven by promises in which actors cannot afford to miss the next generation of technologies. And when technologies diffuse across society, they become normal ingredients of social life and, at the same time, become indispensable for people who want to function in society. In other words: needs are not the starting point of an innovation, but the end result.

7.4 To conclude

In this chapter I have explored the curious case of needs and innovation. Needs are often presented as a starting point for innovation, and new products and systems are seen and justified as fulfilling pre-existing needs. The assumption is that human beings are full of (latent) needs and that technologies are increasingly successful in meeting these needs. On closer inspection, however, needs are the end point of innovation. When new products and systems are successfully taken up, their availability will gradually become taken for granted as a part of social life, to the extent that they are duly missed and “needed” when they happen not to be present. This condition of needs resulting from innovation is relevant to sustainable development in two ways. First, when new products and systems generate a need for them, they are not easily abandoned. Limiting internet use would have been easy twenty years ago, but is now a tedious and cruel task. Limiting car use seems a mission impossible now, while a hundred years ago it still was an option. A second consequence is that the ongoing process of innovation which characterises our modern societies implies the ongoing generation of new needs as well. The pertinent question for sustainability, then, is which new needs we can afford.

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Chapter 8

The users of the technology: the case of solar PV in the Netherlands

Véronique Vasseur and René Kemp

Abstract

This chapter contributes an empirical analysis of the role of users in the adoption of solar photovoltaic (PV) systems. It first concentrates on individual decisions which lead to an adoption decision regarding solar PV, before turning to diffusion processes. We examine the empirical literature on the adoption of solar PV and present the results of our empirical analysis – based on a questionnaire completed by 817 Dutch households. We find that the slow adoption and diffusion of solar PV is not driven by single factors such as price or technology change, but typically involves co-evolution between multiple developments. It is related to consumer preferences, product offerings, and slow introduction of policies to promote the use of renewables. We show that knowledge about solar PV is an important factor underlying the adoption or non-adoption of PV in the Netherlands.

8.1 Introduction

Solar energy has a large technological potential that allows it to become one of the main sources of renewable energy in the long-term future (Gostelie, Maas et al. 2010). Solar PV is a technology that is well-known to the public, but its diffusion has been slow, despite governmental support programmes. This chapter contributes to the literature on socio-technical transitions and that on technological innovation systems by offering an empirical analysis of the role of users in the adoption of solar PV systems, and applies a systems perspective to the literature on diffusion and adoption. The former category of literature describes how new technologies emerge within more or less protected niches, and how they turn into configurations that shape and reshape regimes (e.g. Geels, Kemp, Rotmans). The latter, that of technological innovation studies, focuses on the structure of the system (actors, institutions, and networks) and on the key processes that take place within a system. These processes contribute to the build-up of a technological innovation system and thereby to the successful development, diffusion, and utilisation of the emerging technology (e.g. Hekkert, Negro, Bergek). It is motivated by the observation that these studies give little attention to actual adoption decisions by people. To this end, we introduce the literature on adoption and diffusion of innovations.

The process of adopting innovations has been studied for over 30 years, and one of the most popular adoption models was described by Rogers in his book "Diffusion of Innovations". For Rogers (2003), adoption is a decision of "full use of an innovation as the best course of action available" and rejection is a decision "not to adopt an innovation" (p177). Rogers defines diffusion as "the process in which an innovation is communicated thorough certain channels over time among the members of a social system" (p5). For Rogers, innovation, communication channels, time, and social system are the four key components of the diffusion of innovations.

Adoption is the outcome of an information-processing process resulting in the active or passive acceptance of an innovation. Diffusion is the dissemination of an innovation within a social system. Diffusion theory focuses on how quickly and to what degree a social system accepts an innovation. Although a certain degree of overlap between these concepts may exist, adoption analysis often takes characteristics (of the individual, the innovation, as well as contextual) into account (at a disaggregate level) while diffusion analysis does not, or only to a very small degree (aggregate level).

Thus, diffusion is the result of all the adoption decisions, so an understanding of adoption processes is paramount in attempts to gain more insight into diffusion processes. Adoption decisions drive every diffusion process, and this chapter concentrates on individual decisions which lead to an adoption decision regarding solar PV, before turning to diffusion processes. Although many studies have examined the adoption and diffusion of solar PV, few of them deal with solar energy from a consumer behaviour perspective.

In the following section we examine the empirical literature on adoption of solar PV, and then present the results of our empirical analysis – based on a questionnaire completed by 817 Dutch households. This section also describes how our findings compare to those of others

8.2 Findings in solar energy adoption and diffusion studies

Thomas Sparrow was the first researcher to focus primarily on the decision to purchase solar energy systems. In a study of 45 owner-users of solar custom homes located throughout the United States in 1977, he considered various socio-economic factors involved in the adoption of solar-energy technologies. Sparrow emphasised that there are region-specific differences in consumer attitudes as well as in the factors that are important for those adopting solar energy systems in different geographical regions.

However, his small and geographically diverse sample presents difficulties (Labay and Kinnear 1981). Another study conducted in the United States was undertaken by Cesta and Decker (1978) to identify and measure the attitudes of the public, including consumers. A two-stage Delphi research study identified some factors that may either inhibit or stimulate solar energy adoption and commercialisation. The following factors were found to be important: product cost, lack of product knowledge, lack of governmental support, and public concern over the energy crisis. Cesta and Decker also found that governmental and business actions could help to initiate more solar energy use and developmental efforts (Cesta and Decker 1978).

Several researchers used Rogers' diffusion of innovation theory as their theoretical framework. Labay and Kinnear (1981) used the theory to examine the purchase decision process for residential solar energy systems in one geographical region, the State of Maine. They used multivariate nominal scale analysis to develop classification models based on both attribute perceptions of solar energy systems and demographic characteristics. They discovered that attribute perception data afford somewhat greater classification potential than demographic data. An important aspect in the work of Labay and Kinnear is the inclusion of knowledgeable non-adopters as a group worthy of attention, in addition to adopters and unaware non-adopters. They argued that the knowledgeable non-adopters attached greater value to the product and economic factors (e.g. the quality of the system and the payback period) (Labay and Kinnear 1981), indicating the potential for adoption. Research by Kaplan (1999) also used Rogers' diffusion of innovation theory to investigate why utilities do not adopt solar power, and what might help encourage their interest. They found that motivation, experience, and familiarity (e.g. whether a household has previously installed a similar technology, such as solar heating) are important variables which can influence the interest in solar PV. These findings have significant implications for commercialisation efforts, as well as for the management of utility operations. Kaplan emphasised that small wins, experimentation, and groping along can achieve far more effective diffusion of solar power, with far greater ultimate success, than is expected from the conventional wisdom of large-scale research and development (Kaplan 1999). The study conducted by Faiers and Neame (2006), using householders in central England as a case, also applied Rogers' theory to investigate householders' attitudes towards characteristics of solar systems, and identified some of the barriers to adoption. They surveyed a group of "early adopters" and a group of presumed "early majority" adopters of solar power, and the overall results show that, although the "early majority" demonstrates a positive perception of the environmental characteristics of solar power, its financial, economic, and aesthetic characteristics are limiting adoption (Faiers and Neame 2006). In other words, the actual cost of an innovation is relatively unimportant; what matters is what it is worth to the adopters as individuals. Jager (2006) studied factors that lead to a faster diffusion of solar PV in society from a behavioural perspective. He discussed different consumer motives within a framework of underlying needs and the time sensitivity of various outcomes. Financial support and general problem awareness were found to be critical motives (which can also be seen as 'facilitating factors') in the city of Groningen, but the positive effects of information meetings, technical support meetings, and social networks were also identified. In terms of the factors affecting the speed and degree of diffusion (Rogers 1995), these meetings reduced the complexity of the decision problem as experienced by the buyers (Jager 2006).

Research that considers the influence of the broader socio-technical system on the behavioural responses to solar PV has been conducted by Keirstead (2007). He used solar PV households in the UK as a case to investigate whether the use of solar PV could have a double effect, providing renewable energy as well as inducing certain changes in the use of energy. His research showed that the installation of solar PV encouraged households to reduce their overall electricity consumption by approximately 6% and shifted demand to times of peak generation (Keirstead 2007). Palm and Tengvard (2011) also studied the adoption of solar PV from a broader socio-technical perspective and embedded their work within the transition literature. Analysis of material from in-depth interviews with members of twenty Swedish households revealed that environmental concerns are the main motive for adopting solar PV systems or micro-wind turbines. Other reported motives were ecologically aware lifestyles, symbolic investments (providing a way to display environmental consciousness) a protest against "the system", with its large dominant companies, or a step toward self-sufficiency. Some households rejected these installations because of financial considerations, respect for neighbours who might object, and/or difficulties finding an appropriate site (Palm and Tengvard 2011).

8.3 The adoption and diffusion of solar PV in the Netherlands

A glimpse of the past

Although the first off-grid solar house was opened in the town of Castricum in 1988 (Lysen 2006), the use of solar PV remains rather limited more than 25 years later. The slow growth and even decline in the Netherlands over the years contrasts sharply with the explosive growth in other European countries, Germany for example, where incentive schemes have stimulated the growth of installed PV capacity to such an extent that up to 7 GW is now being produced per year (IEA-PVPS 2014). The Dutch case clearly shows that a major problem in the formation of a domestic market lies in inconsistent government market support. For example, the upward trend of installed PV stalled in 2003, the solar PV market decreased from almost 20 MW per year in 2003 to less than 0.5 MW per year in 2006. The "gold rush of 2003" was the result of a governmental announcement that a subsidy regime would end. No incentive replaced it until 2008, and the new incentive did not have a significant impact on the market. The Dutch policy focused on research and development, with the goal of bringing costs down and raising the efficiency to make solar power more competitive with fossil fuels (Vasseur and Kemp 2011).

Interestingly, there has been a substantial growth since 2011, with 195 MW PV capacity installed over 2012. Falling prices and the possibility of net metering make it more interesting for individuals to install panels without subsidy (IEA-PVPS 2013). This works well with the frontrunners, but it is probably not enough to motivate the majority of citizens, unless there is a win-win situation.

How to get a majority of the citizens involved?

This question is used as a starting point and we assume that the answer is simple: the PV supply side must be more strategic. Rather than develop PV projects based on what "they" think will be attractive to users, they need to test their assumptions among the intended public to fully understand what they want and need and why. Understanding their needs to make adoption easier, more meaningful, and more significant is a prerequisite. Through intensive research, questionnaires, observation, and interviews with (potential) users, we tried to find out what users wanted almost before they were even able to fully express it. In order to classify the respondents, we used a segmentation model which was introduced for the purpose of analysing the diffusion of technological innovations, in particular solar PV (Vasseur and Kemp 2015)[8]. The model

[8] The attitude of PV adopters and individual preferences (adoption or not) were assessed by means of different questions. First we asked whether the respondents owned a PV system. If they did, we asked who had decided on the purchase of the system. If the respondent had decided the purchase by themselves, we labelled this respondent as having a positive attitude, if not, we labelled them as having a neutral or negative

allowed us to answer the question whether adopters and non-adopters consider the same or different attributes in their decisions. The four groups were voluntary adopters, involuntary adopters (people who bought a house equipped with solar PV), potential adopters, and rejecters.

What we found is that adopters consider the costs of adoption affordable, whereas non-adopters view them as too high. The differences have to do with adopters valuing the benefits of this technology more than non-adopters, so they included this determining factor as a benefit of having solar PV, obviously referring to the positive consequences of having a system (e.g. self-sufficiency and environmental benefits). For non-adopters, the benefits of solar PV, which also refer to the positive consequences of having a system, do not outweigh the negative consequences (e.g. costs and financial uncertainty). Whether they adopt PV panels or not is not a matter of costs only, although they certainly are an important element. Unless electricity prices rise significantly and the costs of PV systems decrease substantially, we expect the diffusion of PV systems to remain slow.

Furthermore, we found that one of the reasons why potential adopters had not adopted a system so far is that they lacked knowledge about solar PV. The importance of this emerged from the statistical analysis, where we found that knowledge about solar PV was a predictor of adoption. (The influence of this variable was only revealed by the statistical analysis; the lack of knowledge was not stated by the respondents as a reason for non-adoption.) This suggests that more information about solar energy will stimulate adoption. It is not only information on the costs and quality aspects that is important, but also information on social and environmental matters. The importance of the latter and knowledge about grants and costs were found to be positive predictors of the willingness to adopt. This suggests two useful strategies to stimulate the diffusion of solar PV: reducing the investment costs and increasing the public's knowledge about it. The relative effectiveness of these two strategies cannot be determined from our analysis.

The most important motives to adopt PV are saving electricity costs, the costs of a PV system and the possibility to be self-sufficient. The fact that with the use of a PV system one has less environmental impact has also been an important reason for people to adopt. The innovativeness of a system, the visual aspects and the ease with which a system can be installed were less important motives for our respondents to adopt a system. These results are not in line with the research by Jager (2006) and Palm and Tengvard (2011), who rated the contribution to a better natural environment as the most important motive for adoption. Palm and Tengvard (2011) also indicated the symbolic meaning as an important aspect, which is also not in line with our findings.

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attitude. If they did not own a PV system, a distinction was made between respondents who were willing to purchase a system (indicating that they were in the orientation phase or that they would consider the purchase when more people decided to opt for a system) or not; labelling them as non-adopters with a positive attitude and non-adopters with a negative/neutral attitude, respectively.

As regards the non-determining factors, voluntary adopters were on average middle-aged, highly educated, likely to take major decisions without being influenced by the opinions of others and likely to want to protect the environment, for example by recycling paper and avoiding frequent car use. By contrast, the rejecters had a lower average income, tended to take major decisions after considering other people's opinions, and needed considerable time to take major decisions.

8.4 Conclusion and outlook

We found that the slow adoption and diffusion of solar PV is not driven by single factors such as price or technology change, but typically involves co-evolution between multiple developments. It is related to consumer preferences, product offerings and slow introduction of policies to promote the use of renewables. Knowledgeability has a positive influence on future adoption, confirming the empirical findings of Labay and Kinnear (1981) on the role of knowledge. This suggests that informing the public about the possibilities and procedures may be effective in persuading those interested in adopting solar PV (potential adopters). Similar findings have been reported by Kaplan (1999) and Jager (2006). Many initiatives are emerging to encourage these informative activities, at local and regional levels. These initiatives can provide potential adopters with the necessary information regarding solar energy, in order to reduce perceived complexities, but they can also facilitate the collective procurement of solar PV systems so as to benefit from economies of scale. Most of these initiatives are not connected to the policy process, but are indirectly influenced by the broader debate on the sustainability transition. We argue that these local and regional activities are starting to set the pace and direction of this transition.

In view of this conclusion, it is relevant to ask what is the next step in encouraging the adoption and diffusion of solar PV? We have made a first attempt to include the users of the technology and view them as an important source of information, but we have not yet made an attempt to study the feedback from users that producers have obtained over time. This remains a topic for further research.

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Chapter 9

Sustainability contributions to the energy system: more than one problem to address

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Abstract

Current debates about a more sustainable energy system strongly emphasise the role of CO_2 emissions and climate change. Without denying the urgency of reducing CO_2 emissions, it is important to recognise that this is only one of several categories of requirements for creating a more sustainable energy system. This chapter discusses three of these categories: (1) access and security, (2) climate change and environmental impact, (3) economic and social development. The problem of dealing with three different perspectives is illustrated with reference to the development of concentrated solar power. It is clear that a more sustainable energy system cannot be achieved using the simple creed that renewables reduce CO_2 emissions and are therefore good. Understanding the different issues that need addressing may not in itself resolve disagreement, but will at least create a common understanding of what is involved.

9.1 Introduction

Since any life on earth depends on energy, modern civilisations do so too. Both impacts on and disruptions of the energy system can directly threaten the foundations and futures of societies all around the world. In recent years, much attention has been paid to the problem of global warming. In response to threats posed by global warming, many have advocated increasing the share of renewables in the energy system. Renewables-based electricity is claimed to be more sustainable than conventional fossil fuel because of lower CO_2 emissions. Although this argument is convincing to many, it is important to stress that there are more dimensions to the sustainability problem that need to be taken into account. While a one-dimensional approach may be attractive for its simplicity, it is illusive and even dangerous to use it for making decisions about current and anticipated energy problems.

In this chapter, I give an overview of the main problem dimensions that have been identified in the energy domain. It intends to help sustainability-oriented readers get a better understanding of the complexity that people face when trying to act upon the issues of renewable energy and global warming. Second, I elaborate on one energy technology in particular, to illustrate the complexity of energy-related problems and how they relate to practical dilemmas in decision making and technology development. Concentrated solar power (CSP) is a renewables-based technology that converses solar energy to heat, and then to electricity which can be transported to consumers.

9.2 Challenges to the global energy system

As a rule of thumb, challenges to the energy system can be reduced to three main dimensions. (e.g. Flüeler, Goldblatt, Minsch, & Spreng, 2012):

1. Access and security
2. Climate change and other environmental impacts
3. Economic and social development

Although more detailed classifications do exist, they are not necessarily more inclusive. For the sake of comparison with the above three main challenges, Box 9.1 presents an example of a different classification. The following paragraphs will be used to elaborate upon each of the three challenges.

Box 9.1 Global energy challenges identified by GEA

A more detailed example of the challenges faced by the energy system is given in the Global Energy Assessment (GEA, 2012) . This sizable report proposes seven key global energy challenges:

- “providing **affordable** energy services for the well-being of the 7 billion people today and the **9 billion** people projected by 2050;
- improving living conditions and enhancing economic opportunities, particularly for the 3 billion people who cook with solid fuels today and the 1.4 billion people without **access to electricity**;
- increasing **energy security** for all nations, regions, and communities;
- reducing global energy system greenhouse gas emissions to limit **global warming** to less than 2°C above pre-industrial levels;
- reducing indoor and outdoor **air pollution** from fuel combustion and its impacts on human health; and
- reducing the **adverse effects** and ancillary **risks** associated with some energy systems and to **increase prosperity**.”

(GEA, 2012, p. XV) [emphasis added]

Access to energy and energy security may appear mere technical issues in many Western countries, but it definitely is not. Unexpected geopolitical and natural events may influence or even cut off the supply of energy, and even the most technologically advanced countries go to great lengths to diversify their energy sources (Yergin, 2011). The situation is even more problematic in developing countries, as they struggle to keep up with the rising energy demand, and energy poverty is often a real issue here. A stable energy supply supports economic progress and can give social status, and electric power is connected to social power and conflict in many ways (Flüeler, et al., 2012). The introduction of renewables brings new challenges to secure energy access, as in communities depending on fossil fuels and nuclear power, renewables introduce a new source of instability to currently stable electricity grids. In short, a renewable revolution will lead to many challenges related to grid stability, ownership, intermittency, energy storage, transmission, life styles, and so on.

A second challenge to the energy system relates to climate change and other environmental impacts. CO_2 emissions from the combustion of fossil fuels are a big part of the total greenhouse gas emissions that are claimed to cause anthropogenic climate change. Other environmental impacts from the energy system include different forms of air pollution, land-use changes, and resource use. Over time many of these problems have grown as the energy system evolved, and affect the entire range from the household to the global level (Flüeler, et al., 2012). Responding to these environmental impacts requires both mitigation and adaptation measures, and both bring along new challenges. In addition, the introduction of renewable energy technologies also entails environmental impacts. While the energy sources themselves may be renewable and non-polluting, the technologies and grid modification needed to use renewable energy certainly are not.

Economic and social development forms the third main challenge identified. The world as we know it has been built by relying on relatively cheap fossil fuels. It should therefore not be surprising that even small changes in global supply may have immediate and far-ranging social and economic impacts. Price increases have led to economic recession, but might also enhance energy conservation measures (Flüeler, et al., 2012). At the same time, political and commercial organisations impose rules to stabilise the impacts of the energy system. In view of the complexity of the system, we must always be prepared for unexpected impacts. Mass introduction of renewables in Germany has led industries to lobby for exemptions from contributing to extra energy taxes, creating wider public dissatisfaction with increasing energy bills. In short, whether one advocates renewables or fossil fuels, energy strongly influences economies and societies. The impacts of changes to the energy system are wide-ranging and often impossible to predict.

A sustainable energy system requires each of these three challenges to be met. Moreover, there is no use in approaching each of them in isolation. Access and security, climate change and other environmental impacts, and economic and social development are interrelated. For example, coal-based electricity may allow for stable access to energy and promote economic development. But when considering the construction of a new coal-fired power plant, such concerns are of little use when social and environmental impacts are so detrimental as to threaten the health and environment of the people involved. In China, a country built on coal, political and business leaders have recognised the need to diversify beyond coal to improve the sustainability of its cities (Yergin, 2011). At the same time, 100-m tall windmills may improve air quality and atmospheric carbon levels, but these green machines also generate opposition based on visual impacts and grid stability. The key is to treat energy problems in a holistic manner. There is no such thing as a perfect solution without negative impact. Instead, it is better to recognise that trade-offs have to be made (Gibson, 2005) in the energy system.

The next section discusses some specific energy issues regarding CSP, a renewable energy technology based on conversion of solar thermal power. Specific attention is paid to the translation of very practical technology-specific issues to the three domains of energy challenges. The section illuminates some of the possible trade-offs that result from this.

9.3 Issues and trade-offs regarding CSP

As a starting point for describing a technology, it is common to refer to a collection or configuration of technological artefacts. At its core, CSP consists of a type of solar collector and a thermal energy storage system (Tian & Zhao, 2013). More detailed descriptions distinguish between a heat transfer system, a cooling system, a transmission system, and so on. For each element there are different possible options, and the selection of the most appropriate configuration depends on the specific location and application (Brown, 1983).

Next to physical artefacts, there are also a number of social aspects that can be included in a technology. For example, CSP-generated electricity is sold on electricity markets, and government agencies need to regulate these markets to maintain stability. In addition, CSP requires engineers to build and maintain the plants, and hence education programmes are needed to train the engineers for their job. Together, these different social and technical aspects are described as a socio-technical system (Geels, 2004). Obviously, these different social and technical elements do not exist in isolation from each other, as it is the whole that we need to consider to form CSP. This makes it possible to say that technical and social elements interact and shape each other (Bijker & Law, 1992).

Just like renewables in general, solar energy is also claimed to be clean and abundant (Kalogirou, 2004). And similarly, collecting, converting, and transporting solar power for future use generates pollution and other side-effects. Like any energy technology, CSP is not free of negative impacts either. This section further elaborates on some practical issues that influence the contribution of CSP to a more sustainable energy system. It also elaborates on some trade-offs that emerge in decision-making about CSP.

Intermittency

A key issue with solar based technologies is that they have a fluctuating output, depending on the availability of sunshine. Less solar energy will reach a CSP plant when it is cloudy, and none at all at night. This fluctuation in output is called intermittency. Intermittency is greatest with wind energy, but has also been used as an argument against many other renewables, because it would threaten the stability of the energy net, leading to black-outs. As the electricity net cannot store energy itself, a scenario in which renewables become the dominant energy source would require either an amount of energy to be stored somewhere or flexible demand for energy, which in both cases must be able to be used instantly (MacKay, 2008, p. 186). A key advantage of CSP is that it generates heat – thermal energy – which can be stored directly, and more efficiently than alternative storage options, as alternative options such as batteries require an additional conversion step in which energy is lost (Palgrave, 2008). Thermal energy storage allows CSP to supply electricity on demand, thus addressing the problem of the intermittency of solar energy (Guillot et al., 2012). This increases the security of energy access. At the same time, it allows more renewables-based technologies to be connected to the grid, thus lowering average CO_2 emissions. The properties of CSP in terms of dealing with the intermittency of renewables appear to have so far been underemphasised, though it has been argued that these should be taken into account in investment decisions on renewables in the energy system (Kost, Flath, & Möst, 2013).

Resource use

In the second section we have noted that renewable energy based technologies also generate environmental impacts. One of these impacts is related to resource use. An inventory account of all the resources needed to build a large-scale CSP infrastructure has provided evidence for the conclusion that resource scarcity is not expected to become a major issue in future CSP development (Pihl, Kushnir, Sandén, & Johnsson, 2012). At the same time, it is recognised that water usage poses a different and complex problem. Most CSP plants require large amounts of water for cooling purposes at the site of the plant (Damerau, Williges, Patt, & Gauché, 2011). This creates a sustainability challenge, as deployment of CSP is intended for water-scarce desert regions. Dry cooling systems or desalination of salt water have been identified as possible solutions to this problem, but come with an energy penalty (Damerau, et al., 2011). Withdrawing large amounts of water from a water-scarce region will impact on local ecosystems and at the same time risk social unrest.

Conversion efficiencies

The efficiency with which a technology can convert one type of energy into another is called conversion efficiency. In CSP, the thermal energy of the solar power collected is converted to electric energy using a turbine or generator. High conversion efficiencies allow a technology to optimise the use of the energy embodied in the energy source. In principle, higher conversion efficiencies create a competitive advantage for a technology as they enable it to generate electricity at lower prices. Additionally, higher conversion efficiencies decrease the number of power plants and resources required to produce a certain amount of electricity. Unfortunately, increases in conversion efficiency may bring along higher costs as well. A trade-off between conversion efficiencies and investment costs also affects current CSP developments. A distinction can be made here between two types of technologies. Parabolic-trough CSP systems are cheap and proven over time, and operate at relatively low temperatures around 400°C. CSP power towers can generate higher temperatures of up to 1000°C, allowing for higher conversion efficiencies. However, they are more expensive to build than parabolic-trough plants (Taggart, 2008). Trade-offs between conversion efficiency and costs provide a key challenge to decision making on CSP.

9.4 Concluding remarks

This chapter has shown that various concrete technological choices are inherent in a range of socio-technical and environmental debates. As a rule of thumb, there are three main challenges to the energy system: access and security, climate change and environmental impact, and economic and social development. This chapter has elaborated upon the main challenges and illustrated them using examples of solar-based technology. Briefly, the intermittency of renewables challenges the security of the energy system, even though CSP can play a positive role here. Water used in wet cooling of CSP puts an environmental burden on already water-poor areas. Decisions on conversion efficiencies trigger technological development and consequently economic and social development.

Energy issues are not confined within the boundaries of one specific challenge. The choice to use dry cooling technologies comes with an energy penalty, which has an impact on economic growth and might restrict access to energy for the poorest communities. Thermal energy storage may lead to pressures on investment decisions. Conversion efficiencies are not merely a cost issue but also affect the number of electricity plants that need to be built, causing different environmental impacts. The interrelatedness of different types of side-effects adds to the complexity of decision making in the energy domain.

Sustainability scholars interested or involved in decision making in the energy domain should be appreciative of the multiple and interconnected dimensions of the energy question. A more sustainable energy system cannot be achieved using the simple creed that renewables reduce CO_2 and are therefore good. In a sense it should not matter whether one works for Big Oil or supports Greenpeace. Both need to recognise energy security and environmental, economic, and social impacts. Understanding the different issues that need addressing may not in itself resolve disagreement, but will at least create a common understanding of what is involved.

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Chapter 10

Sustainable business model innovation for positive societal and environmental impact

Nancy Bocken and Anja van Bogaert

Abstract

Tackling global challenges requires a more holistic view of doing business, by integrating sustainability into the core of business practices. The challenges to the business community regard not only the aim of remaining competitive; they are about creating a new role for business in society, as a solution to our biggest global challenges. A range of businesses are preparing to take responsibility for resolving some of these challenges. New sustainable business model archetypes are emerging. Ultimately, "shared value creation" is about the need to involve key stakeholders, including representatives of environmental groups and society as a whole in the early stages of the innovation process. Although tools such as stakeholder and value mapping to assist sustainable business model innovation are emerging, more work is required from society, government, and the business community in creating and assessing multiple, sustainable values through businesses, as part of a wider system of stakeholders.

10.1 Sustainable innovation and shared value creation

Global challenges such as climate change, scarcity of resources, and the economic crisis have been affecting our current economic and social system, and as a result also businesses and their operations. While industry has brought prosperity, it has also been a root cause of some of these key challenges. Aware of their negative externalities and driven by legislation, businesses have slowly started to internalise some of their negative externalities, through pollution control and waste reductions. After the publication of the “Limits to growth” (Meadows, 1972), “Our common future” (Brundtland, 1987) and “Cannibals with forks” (Elkington, 1997) reports, businesses started to incorporate sustainability in their strategy by adopting a “Triple-P” (People, Planet, Profit) or Corporate Social Responsibility (CSR) approach.

Unfortunately, “sustainability” and CSR have also been misused as marketing and PR tools, and sustainability has not always been incorporated properly into the core of businesses. Efforts regarding “eco-efficiency”, efficiency improvements with environmental benefits, and awareness of social and environmental issues in supply chains are common, but businesses model innovations to fully incorporate sustainability are not. As such, CSR efforts have not yet improved the social and environmental impact of businesses (Porter and Kramer 2006) as fully as they could have. Porter argues that companies must take the lead in bringing business and society back together (Porter and Kramer, 2011). This should be done on the principle of shared value, which involves creating economic value in a way that also creates value for society, by addressing its needs and challenges. Shared value creation acknowledges trade-offs between short-term profitability and social or environmental goals, but focuses more on the opportunities to derive competitive advantages from building a social value proposition into corporate strategies. Creating value for different stakeholders (e.g. employees, suppliers, local communities) seems to pay off for multinationals such as Philips and Unilever, which have developed innovations for the Bottom of the Pyramid (the largest, but poorest socio-economic group), and involved local communities in the value chain. “Shared value” offers many opportunities for innovation and growth, by tackling social and environmental problems as core business objectives.

Tackling global challenges requires a more holistic view of doing business, by integrating sustainability into the core of business practices. It is not about changing particular aspects of a business, but about fundamentally changing the way business is done at all levels, to ensure a positive influence on society and the environment (Bocken et al., 2015). It includes the transformation of our global systems and infrastructures, so that businesses are incentivised to operate in a sustainable way. It is about the integration of the three dimensions of sustainability – social, environmental, and economic (Elkington, 1997) – into the way business is done, in a manner that balances and aligns value creation for all stakeholders, including the environment and society, at all levels and through all activities (Stubbs and Cocklin, 2008; Boons and Lüdeke-Freund, 2013; Bocken et al., 2013). As Freeman (2010) quoted: “Stakeholders are about the business and business is about the stakeholders”. Freeman (2010) explained that according to “stakeholder theory”, businesses should create value with and for all stakeholders – suppliers, customers, employees, financiers, and communities – and that all stakeholders are related and interdependent.

The stakeholder notion has clear links to the open innovation concept, where corporate innovation activities are organised more like an “open system” rather than the twentieth-century model of vertical integration, under the assumption that sources of innovative ideas often come from outside firms (Chesbrough 2006). Firms can enrich their innovation practices by “internalising” external technologies, seeking new markets through licensing technologies (ibid.), and finding promising ways to collaborate with others to innovate, whether these are sustainable businesses or NGOs.

10.2 A new collaborative role for business in society

The challenges to businesses concern not only remaining competitive; they are about creating a new role for business in society, as a solution to our biggest global challenges. As described in the working paper on Transformative Social Innovation Theory (Avelino et al., 2013), our society faces “game-changing” macro-phenomena, such as the economic crisis, climate change and ICT developments with various “narratives of change” or “counter-movements” such as the “new economy” (sharing economy or circular economy), which has its effects at different levels and on system innovations and social innovations (new design, new forms of ownership and business models). These all influence the current process of societal transformation. Jonker (2014) argues that we live in a transition phase to another type of society (2014) where organisations are changing by striving for multiple value creation. Other ways of organising and networking are necessary. It is about emphasising organisations’ “collaboration ability and capability”, rather than their organisational abilities. Businesses are no longer necessarily in the lead, as a result of more bottom-up collaborative innovation in society (e.g. peer-to-peer business models such as peer-to-peer lending). There will be a shift towards collective co-creation and multiple shared value creation, with people collaborating across organisations instead of merely within organisations. Those people, who purposefully connect businesses and industries through collaboration, the so-called “extrapreneurs”, will function as the “brokers”.

In this “new society”, businesses and other organisations will find new ways of creating value driving their business innovations and enhancing “open innovations”. Social innovation and social entrepreneurship will be stimulated. Together, this will create value for the public. It is important for society, government, and business that research is done into creating and assessing multiple, sustainable values through businesses as part of a wider system of stakeholders. New ways of thinking are required, where environmental and societal concerns are as important as individual customer gains or an individual firm's profitability. Ultimately, "shared value creation" (Porter & Kramer, 2011) is about the need to involve key stakeholders, including representatives of environmental groups and society (e.g. local communities) in the early stages of the innovation process. This means that the potential users of a product or process, or, more broadly, a business model, are no longer mere "receivers" of such innovations, but are actively included in the innovation process to optimise the outcome for all. Although this may seem idealistic, several businesses are already taking a more inclusive, collaborative, and sustainable approach to doing business (see box 10.1 below).

Box 10.1 Sustainable business approaches

Social enterprises such as "Solar Sister" and "Sunny Money" take an inclusive approach to doing business, involving local community members as entrepreneurs and making solar-based energy and technologies more accessible.

In the for-profit domain, several businesses are adopting more sustainable business models. SolarCity in the US is making solar energy more affordable and accessible. Car sharing, power tool sharing, house sharing, and other "sharing schemes" can create a community feel and drive good behaviours (e.g. reducing car use; reducing the need to own "stuff"). Seats2meet.com, by origin a supplier of meeting rooms, aspires to create shared value for multiple stakeholders through its new business model. Seats2meet.com uses its knowledge and events to enable sharing of unused spaces and connect knowledge workers from organisations and self-employed people.

Large businesses such as Unilever and Interface try to involve local communities in their value chains and ensure they benefit from the way they do business, and Philips wants to create conflict-free value chains. Together with the Electronic Industry Citizenship Coalition and the Global eSustainability Initiative Extractives Work Group, Philips and other businesses in the industry have created a Conflict-Free Smelter programme by organising multi-stakeholder sessions. Smelters can demonstrate that the raw materials they procure do not originate from sources that contribute to conflict in the Democratic Republic of Congo, and suppliers are able to source metals from conflict-free smelters. Philips' Conflict-Free Tin Initiative, to stimulate cooperation and economic growth in the region outside the control of rebel forces, can ensure a more broadly controlled conflict-free supply chain of tin.

An example of a public-private partnership is “Het Groene Net”, a local sustainable energy company being set up in the south of the Netherlands, which, through an underground pipe network, uses renewable heat from Biomass Energy Sittard and waste heat from the industrial site called Chemelot for heating and cooling homes and businesses in different local municipalities. Businesses, buildings, and homes that are connected to “Het Groene Net” save on their energy costs and owners do not need to invest or reinvest in heating or cooling. This construction was an intensive co-creation process with many stakeholders, and is an example of “industrial symbiosis”, where collaboration results in “waste” (e.g. heat, CO_2) being turned into a “resource”.

10.3 Sustainable business

It may be clear that pressures on businesses to operate more sustainably are increasing, requiring them to adopt a systemic approach that integrates consideration of the three dimensions of sustainability – social, environmental, and economic – in a way that generates shared value creation for all stakeholders, including the environment and society. This can be referred to as “sustainable business thinking” (Bocken et al., 2015). Ansari et al. (2013) identified three high-level steps that we need to go through to resolve the “Tragedy of the Commons”: issues related to our global resource use, climate change, and water use that are not easy to resolve because they are shared and used by all global citizens without clear ownership and responsibility. These steps are: (1) recognition of the interconnected fate; (2) acceptance of responsibility by all; (3) collective commitment to act. If key stakeholders, whether businesses, citizens, or governments, fail to meet some, or even worse, all of these conditions, it will be hard to find solutions to pressing global challenges such as climate change. For example, at the time of writing, no binding global agreements to resolve climate change have been established, which is standing in the way of mitigating global change. However, individual countries such as the UK and the US, as well as the EU, have established specific carbon emissions targets.

Fortunately, as described above, a range of businesses are preparing to take responsibility for resolving some of these global challenges, and a few examples of these have already been given above. Forward-looking businesses such as Vitsœ (durable furniture) and Patagonia (an outdoor gear brand) are questioning our consumption patterns, and accept slow growth and stability as a reality rather than fast-paced sales and over-consumption. The outdoor gear producer Patagonia, through its firm “Patagonia Provisions”, also wants to bring back wild salmon and improve the land on which it grows food, rather than exhausting it. Home improvement retailer Kingfisher aims to plant more trees than it uses for the goods it sells through its retail business. Carpet manufacturers such as Interface and Desso, in collaboration with various partners such as the Zoological Society of London, local communities in Asia, and supplier Aquafil, source waste from the sea and help turn this into new materials and products as part of the "Healthy Seas" initiative. AB Sugar, the biggest sugar refiner in Great Britain, is now the biggest tomato grower as well, by turning the waste (latent heat and CO_2) from its Wissington factory into value, piping them into greenhouses to grow tomatoes (Short et al., 2014). This is only one of its innovations to create "value from waste" (ibid.). "Women on Wings" combines the Dutch knowledge of suitable business models and product design with the products that Indian women make in rural areas, and assists these women in starting their own business, from production to sales. Airbnb connects owners of houses or apartments online with tourists and others seeking short-term accommodations, which can support the local economy and help homeowners pay their bills in financially difficult times. In "sharing models" such as Airbnb and Couchsurfing (home sharing) and Blablacar and Buzzcar (car sharing), trust is very important, which is facilitated by peer review, a model which had already been tested and used by companies such as Ebay and other peer-to-peer online market places for some time. Sharing, perhaps not surprisingly, has the benefit of creating economic, environmental, and societal shared value. Although they are not perfect – for example, lawsuits have been filed against various "sharing businesses", predominantly by incumbent businesses in the industry, for not following industry rules and regulations – these businesses are creating a shift in existing dominant business models by challenging how business is done.

Still, "sustainable business thinking" is not yet common practice in everyday business operations, whereas it can be very beneficial to businesses. This is perhaps because of the challenges of incorporating societal, environmental, and economic concerns into the way business is done. Crane et al. (2014) in their critique of the concept of "shared value creation" argue that this concept might be challenging to realise: shared value opportunities are not always evident, but rather manifest themselves in terms of dilemmas. It therefore depends on the creativeness of decision makers to spot sustainable shared value creation opportunities and to develop these into good business opportunities. Still, sustainable business models, which incorporate environmental and societal concerns into the business model in addition to profits, and consider benefits for a network of stakeholders rather than just one business (Stubbs & Cocklin, 2008) seem to pay off for those engaged in them. A joint study by MIT Sloan Management Review and the Boston Consultancy Group found that nearly 50% of the businesses they surveyed had changed their business model because of sustainability opportunities (Kiron et al., 2013). The majority of these businesses said that "sustainability" provided additional profits (ibid.). Opening up new business opportunities and cost savings are examples of economic benefits of sustainable business model innovations. Considering environmental (and societal) concerns at early stages of the innovation process is essential, because once product specifications have been decided upon, only minor changes to the sustainability of the product can be made (Bocken et al., 2014).

10.4 Business model innovation and value mapping

Business models broadly define "how business is done" (Magretta, 2002). A business model is a useful framework for system-level innovation for sustainability, because it provides the linkage between a firm's key activities, such as design, production, supply chains, partnerships, and distribution channels (Bocken et al., 2015). Hence, the business model can provide a useful perspective for encouraging "sustainable business thinking".

What tools could help businesses innovate their business models? Value mapping is an approach developed for sustainable business modelling, the development of new sustainable business models, or adapting current business models for sustainability (Bocken et al., 2013). Value mapping aims to inspire innovation by helping companies consider the value that is missed or destroyed for their key stakeholders by the way business is done (Bocken et al., 2014a; 2015). Specifically, "society" and "the environment" are considered to be key stakeholders (Stubbs & Cocklin, 2008). Having considered the value missed (e.g. through waste or overcapacity) and destroyed (e.g. by pollution or deforestation) for those key stakeholders, companies can start thinking about new forms of sustainable value creation. A simple "value map" has been developed to highlight those forms that are of value to multiple stakeholders. Figure 10.1 shows an example of such a value map, which was used during a session with students aiming to develop sustainable business models for the clothing industry. Generally speaking, the value mapping process aims to help businesses find new ways of achieving more inclusive shared value creation by considering key stakeholders and including "society" and "the environment" as key stakeholders. It is about taking responsibility for our "Commons" in the way business is done (Ansari et al., 2013).

The process of value mapping (Bocken et al., 2013) can thus help to promote wider sustainable business thinking and shared value creation. It consists of a few simple steps:

1) Consider the purpose of the business and the value it currently captures for a range of stakeholders.
2) What value is being destroyed for key stakeholders? For instance, are resources being depleted, is pollution being created or are stakeholders being exploited? These might be referred to as "negative externalities" in conventional economics, but we found the term "value destroyed" far more effective to make it clear that valuable resources are being destroyed.
3) Consider the value missed for the key stakeholders. Where are resources or skills being wasted? Where is there a failure to capture financial value or added value that needs to be addressed?
4) Having gone through this process in sequence, it is time to start thinking about new opportunities. Aware of the value missed and destroyed for key stakeholders, businesses can start thinking about new opportunities for shared value creation.

Going through such a process, as an individual business, or better, as a business in collaboration with key stakeholders, can help provide businesses with new insights for sustainable business model innovation.

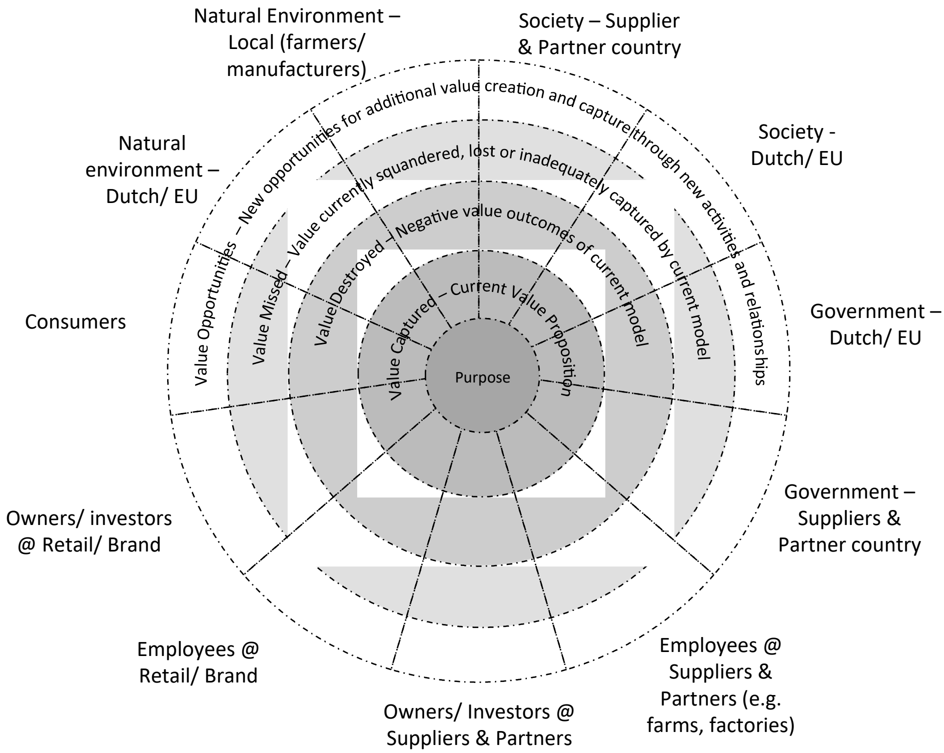

Figure 10.1 Value map used during an educational workshop
Source: developed from Short et al. (2012) and Bocken et al. (2013; 2015)

10.5 Examples of sustainable business model innovations

What might sustainable business models look like? Sustainable business model innovations can be more technologically focused (e.g. moving from fossil fuels to solar energy), more social (e.g. providing community benefits and benefits for workers), or more organisational (e.g. changing the purpose towards sustainability) (Boons and Lüdeke-Freund, 2013; Bocken et al., 2014b). Within this classification, there might be several options. A range of sustainable business model archetypes (Bocken et al., 2014b) have been developed in the literature (see Figure 10.2). Together, these build up a sustainable business model.

Figure 10.2 Sustainable Business Model Archetypes
Source: Bocken et al., (2014b); image and interactive framework available at: www.planc.eu/bmix

Briefly, the eight sustainable business model archetypes are:

1) Resource use optimisation and prevention – Examples of resource use optimisation include doing more with fewer resources, generating less waste, emissions, and pollution to enhance efficiency and save costs. Lean manufacturing but also clever design using limited resources to deliver a function and multi-functional design.
2) Circularity or closing resource loops – options for turning waste into new useful resources and making better use of under-utilised capacity to reduce costs and generate new revenue streams. Two examples are the aforementioned “industrial symbiosis” examples of “Het Groene Net” and AB Sugar’s Wissington factory.
3) Substitution with renewables – Environmental impacts can be reduced and business resilience increased by addressing resource constraints associated with non-renewable resources and current production systems to reduce finite resource use, waste, and pollution. Examples of substituting with renewables include solar businesses such as SolarCity and Sunny Money.
4) Functionality, not ownership - Providing services that satisfy users’ needs without having to own physical products, in order to reduce the total needs for physical products and encourage the right behaviours among businesses and consumers. Examples include laundrettes and clothing rental services (e.g. the start-ups Rentez-Vous and the Dutch “Kledingbibliotheek”.
5) Stewardship – Proactively engaging with all stakeholders to ensure the long-term health and wellbeing of the planet (e.g. watersheds, forests) and society (e.g. happiness, health). Examples include choice editing by retailers (e.g. banning unethically sourced meat or unsustainably caught fish) and ethical trade.
6) Slowing consumption rates – Solutions that actively seek to reduce consumption, and hence production, in order to reduce resource consumption, encourages sustainable living, and long-term customer loyalty, and open up new repair and service markets. Examples include Energy Service Companies (ESCOs), incentivising

customers to use less energy, and durable but more premium brands which try to encourage slower consumption (e.g. Vitsœ and Patagonia as discussed above).

7) Co-creation – Innovations focusing on pooling and sharing resources, knowledge, ownership, and wealth creation to leverage resources and talents and create new business opportunities. Good examples include peer-to-peer car- and home-sharing models and peer-to-peer lending.
8) Social entrepreneurship – Creating options to generate social value – not wealth – is the central criterion for a successful social entrepreneur delivering positive societal and environmental value and securing resource capacity for long-term business viability. Examples include social enterprises and benefit (B-) corporations, where societal benefits of the business are central to the purpose.

In isolation, these archetypes can contribute to higher levels of sustainability, but a much more powerful opportunity will be to combine multiple business model innovations or archetypes. For example, in the aforementioned example of SolarSister, the model combines social entrepreneurship and substitution with renewables: it wants to address the role of women in society by improving their skills base, while replacing fossil fuel based technologies with solar-based ones. In the case of another “solar example”, SolarCity, this US-based business offers solar energy without the high upfront cost of solar panels, by selling energy contracts to customers and installing the solar panels for free. This makes solar energy much more accessible and affordable for a wider range of customers.

10.6 Towards sustainable businesses

Several businesses are starting to reap the benefits of sustainable business model innovation (Kiron et al., 2013). Although no business is perfect yet, there are several positive signs of businesses transforming to create benefits not only for themselves and their shareholders, but also for a much wider range of stakeholders. Tools such as value mapping and examples such as the sustainable business model archetypes might help businesses get ahead in the process of sustainable business model innovation. Inclusive or more shared ways of creating value, through collaborations between businesses, citizens, and governments can be an important driver of sustainable business model innovation to address our global common issues. When the mind-set is there, and companies feel responsible and committed to act (Ansari et al., 2013), they can really contribute to solving environmental and societal issues, rather than being the cause of them. The three generic steps of (1) recognising the issue, (2) accepting individual responsibility in a big global issue and (3) committing to act (Ansari et al., 2014) need to be combined with an essential fourth one: (4) acting upon this. The four steps might sound simple, but each depends on the commitment of individuals or groups of individuals (e.g. policy makers, business leaders, citizens) to take responsibility, and a commitment to work towards a common goal. The future of business will need to be collaborative and inclusive if we are to address the key global issues we are facing, and use business as a vehicle for positive societal and environmental impact.

Organising this new way of doing businesses requires different leadership and competences. For example, the additional key competencies that sustainability professionals need to enable them to act from a holistic point of view include: (1) systems-thinking competence, (2) anticipatory competence, (3) normative competence, (4) strategic competence, and (5) interpersonal competence (Wiek 2011). People should be able to analyse a problem or opportunity from a holistic perspective (systems-thinking competence); assess the problem and its context comprehensively with respect to sustainability (normative competence); construct non-intervention scenarios about how the problem might play out in the future (anticipatory competence); envision sustainable future states in contrast to the non-intervention scenarios (anticipatory and normative competence); and create intervention strategies to avoid undesirable scenarios and realise sustainability visions (strategic competence) (Wiek 2011). Doing this requires close collaboration with researchers from other disciplines, and with stakeholders in government, the business community, and civil society (interpersonal competence).

In summary, different approaches and methods (learning environments, co-creation, open networks) are needed to solve our future challenges and transform our society. In addition, we need a new form of (personal) leadership (Scharmer, 2009) and, related to this, “presencing”, i.e. realising our full potential in line with societal needs (building on Senge et al., 2005; 2008). The transition to a more sustainable society and industry is happening and, even though it takes effort, resources, and creativity, and is not easily achieved (Crane et al., 2014), we, as individuals, should seize the opportunity to contribute to this positive change.

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Chapter 11

Challenges in the transition to a circular economy: understanding the web of constraints to more efficient resource use[9]

Marc Dijk and René Kemp

[9] This paper is based on collaborative work by Rene Kemp (ICIS, MU) and Teresa Domenech (UCL) within the Polfree project, especially on the following joint publications: Kemp and Dijk (2013), Dijk et al. (2015) and Domenech et al (2015).

Abstract

The concept of the circular economy has attracted the attention of policy makers and businesses in recent years. However, changing the current patterns of resource use, waste, and emissions is complex, since they involve causes, effects, and other interlinkages between economic, environmental, institutional, and socio-cultural processes. This chapter presents an example of an integrative approach to the study of innovation, one of the research lines at ICIS. We propose to move from the concept of a "barrier" to resource efficiency to the notion of a "web of constraints", in an attempt to consider the complex web of interlinked factors that interact with each other dynamically as well as simultaneously. We use the resource-intensive case of passenger mobility to illustrate how the interaction between supply and demand through aggregated outcomes creates conditions that drive and/or hamper resource-efficient practices. Implications of the web-of-constraints perspective for policy are discussed at the end of the chapter, where we draw conclusions about what policy makers can do to counteract the inefficient use of resources for the case of mobility.

11.1 Introduction: why are resources used inefficiently?

The concept of the circular economy has attracted the attention of policy makers and the business community in recent years. The circular economy is a system that is "restorative or regenerative by intention and design" (EMF, 2013) and in which waste is minimised by cycling and cascading resources through changes in the design of products, processes, and industrial systems. In a circular economy, resources are kept in use for as long as possible, and then recovered for re-use to make new products. Components of a circular economy include long product life, product repair and reuse, recycling of product components, re-use of waste, and service leasing. The circular economy is based on the 3 R's of Reduction, Recycling, and Reuse. In some visions, pollution, the use of fossil fuels and the use of toxic chemicals are to be strictly avoided, while in other visions, they are allowed provided that the pollution is used as a production input (for instance in construction materials) and environmental harms are minimised. Resource efficiency is a key component of any strategy aiming to increase the circularity of an economy and improve the way resources are used. Resource efficiency refers to the ability to use a reduced quantity or volume of resources to produce the same or an improved service or product. It is measured as the ratio between useful material output (Mo) and material input (Mi), both measured in physical terms (Dahlstrom and Ekins, 2005).

It has been argued that resource efficiency and the circular economy are win-win approaches that align with the environmental and economic rationale (Geng et al., 2014). Price increases in the commodity markets since 2000 have helped to promote the idea that resources are scarce and their preservation may bring economic advantages that range from cost savings to issues of resource security. A number of studies have also pointed out the business opportunities offered by increasing resource efficiency and circularity. The resource revolution report by McKinsey (2011) estimated that opportunities for improving resource efficiency could be in the region of USD 2.9 trillion globally in 2030. Net benefits for a number of key sectors in Europe are expected to be in the region of EUR 603 billion (AMEC&BIO IS, 2013).

If the benefits ensuing from resource-efficient behaviour are potentially high, one question that arises is why these opportunities are not being picked up by organisations and/or societies? Various studies have applied the notion of a "barrier to resource efficiency", suggesting there is a single and concrete factor that explains resource inefficiency, a factor that can be individually tackled and removed, for example by means of a specific policy instrument. Rational choice based approaches have dominated explanations of barriers to individual (pro-environmental) behaviour, including aspects such as individual perceptions of certain options for action, behavioural costs, the role of information, perceived utility or sanctions by others. Based on one of the three key research perspectives at ICIS, Innovation for Sustainability, Kemp and Dijk (2013) suggested, however, that there is a myriad of barriers that prevent more resource-efficient behaviour by different actors. Moreover, these barriers seem to interact and operate simultaneously, resulting in framework conditions that impede the efficient use of resources. They proposed the concept of a “web of constraints” to better capture the complex interaction between individual and institutional behavioural patterns, inertia, and direct and indirect linkages that result in inefficient use of resources. This concept of a web of constraints contributes to an understanding of why these opportunities are not being implemented and the decision making and rationale behind actors’ behaviour. The focus of this paper is precisely to explore the question of why resources are being used inefficiently and to identify the challenges to achieving better resource use. It illustrates this for one resource-intensive sector, that of passenger mobility. Section 2 provides examples of the web of constraints preventing the uptake of more resource-efficient mobility systems and identifies avenues for policy intervention to help overcome these constraints. Section 3 draws some conclusions, discusses the lessons learnt, and identifies future research needs.

11.2 The web of constraints in the mobility sector

The mobility sector is the second biggest contributor to greenhouse gas (GHG) emissions in the EU, and about two-thirds of the transport-related emissions are associated with the road transport sector. Also, interestingly, while GHG emissions from other sectors have shown a decreasing trend since 1990, emissions from transport increased by over 30% between 1990 and 2007. Transport-related emissions started to decrease in 2008, but in 2011 they were still over 20% higher than 1990 levels (EUROSTAT, 2015). In addition to GHG emissions, the sector is also the source of other environmental impacts such as local air pollution, land use, etc.

Our integrative approach to innovation is rooted in the socio-technical study of innovation (which covers sustainability transition studies and actor network theory). More than, for instance, innovation system approaches, it seeks to put greater emphasis on actor perspectives. Our approach to exploring the web of constraints to resource efficiency improvement in the car-passenger sector broadly consists of three steps: innovation framing analysis, innovation dynamics analysis and innovation policy options. Making explicit the framing of the innovation issue by relevant stakeholders is an activity fundamental to (and part of) the analytical process. We acknowledge that where innovation issues are concerned, innovation may be desired or pursued by some but not by others - in other words: various stakeholders can have different views on the overarching issue: “how can this product or practice become ‘better’ (however defined) or more sustainable?” The first step of our analysis is the description of key stakeholder perspectives. The second is a systemic analysis of interlinkages between economic, environmental, institutional, and socio-cultural processes. In the third step, innovation policy options are formulated. We elaborate these three steps briefly for the case of passenger mobility.

Innovation framing: stakeholder perspectives

The key stakeholders in passenger mobility are travellers, car manufacturers, public transport operators and policy makers. Given the importance of car emissions, an ICIS study analysed how car users frame the drivetrain of cars, by means of a discourse analysis of 180 stories that were published in newspaper media in the Netherlands between 1990 and 2005 (Dijk, 2010). The study found three distinct perspectives. The first was that of a small group of green drivers who acknowledge that car emissions should be prevented and who admit they need to change something (e.g. accept higher prices or less convenience). For a larger second group, car mobility is merely “driving from A to B”. They have little attention for their emissions and price is a key attribute, followed by convenience. For the third and largest group, “power is pleasure ”. These drivers are willing to accept a higher price for a more powerful engine (with various motivations), and emissions are not on their radar.

Subsequently, the study analysed how global car manufacturers frame the development of new car engines, especially Low Emission Vehicles (LEV). It examined the framing used by firms by studying their belief systems and actual engagement in R&D, using a questionnaire survey developed after interviews at three global vehicle manufacturers and four local car salesmen. The central question was: which underlying beliefs drive the engagement in the development of LEV technology? Three distinct perspectives were found: that of “optimists”, who happened to be relatively strong on clean propulsion technologies; pessimists, with limited in-house clean-tech competences; and those uncertain about the issue. Finally, the study addressed how urban policy makers frame urban car use issues in general, and the effectiveness of Park+Ride facilities in particular, using a questionnaire survey in 45 major cities in Europe (after a round of interviews with urban transport policy makers). Policy frames ranged from parking policy being “a tool to attract visitors” to “a tool to restrain traffic” in other cities.

Innovation dynamics: integrative, systemic analysis

In order to understand the dynamics of car mobility issues, the same study developed a micro-macro (conceptual) model of the issue. At the micro level, the model includes stakeholder attributes such as perceived return-on-investment (for firms) and the relative importance of functionality, price, status, resource use, etc. (for consumers). At macro level, it incorporates aggregative variables such as total use (sales) and prices. The model regards actors (or groups of actors) as the basic element of analysis and maps out various cause-and-effect chains between micro and macro indicators (see Figure 11.1). The qualitative systemic analysis (QSA) goes beyond simple drivers and linear cause-and-effect relationships in that it emphasises mutually reinforcing developments and (sometimes unexpected) alignments, co-evolution, circular causality, knock-on effects, and hype–disappointment cycles.

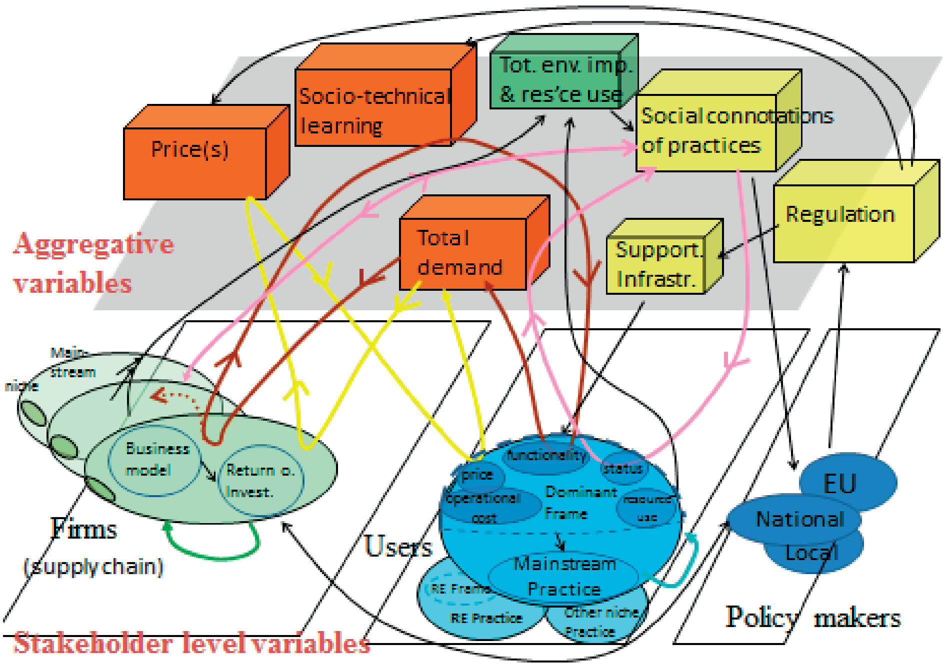

Figure 11.1 A conceptual model to understand passenger mobility, including six feedback loops: increasing returns-to-scale (yellow), learning-by-doing (green), learning by users (blue), learning from the market (brown), and cultural taste formation (pink), as well as competition between products. It also includes environmental externalities and regulation (black). See Kemp and Dijk (2013) for more details.

A number of policies have been put in place to reduce emissions by the sector. The EU has set binding emissions targets for light-duty vehicles and has put in place regulations to ensure that consumers are provided with relevant information through CO_2 labelling. However, the policy framework for transport policies is a complex one with multi-layered interactions between different policy areas and stakeholders. Trade-offs and counteracting effects have been identified, for example between measures to reduce road-transport associated GHG and the development of infrastructures and roads to promote the free movement of goods and people across the EU. Also, the number of cars per 1000 inhabitants in the EU increased since 1995, from 380 in 1995 to 487 in 2012 (ACEA, n.d.). Although CO2 standards have successfully reduced the emissions of new cars, there is still no coherent framework to provide incentives to consumers/

citizens to shift between transport modes and reduce car reliance or the mileage travelled by passenger cars.

Using a combination of a survey, focus groups and individual in-depth interviews across three different EU countries Kammerlander et al. (2014) explored the factors influencing individual behaviours in relation to mobility and car use. Findings from the study showed a willingness to reduce car use, with 49% of the respondents saying they would like to use the car less. However, reasons for doing so were mainly to do with reducing costs and saving money, and to “take more exercise”, while protection of the environment and resource efficiency came only in third place (with 39% of the respondents regarding them as a reason to reduce their car use). It is also relevant to note that 28% of the respondents indicated that they had already reduced their car use to a minimum. Interestingly, the main reason reported by car users as making it difficult for them to reduce their car use was that “public transport is not a good alternative”. This statement (in the form of a claim) was especially common in countries such as Austria and the Netherlands, even though these have good public transport networks. This suggests that subjective perception and objective fact may diverge, which may be partly explained by attitudes as to what is acceptable and convenient. Only a small proportion of the respondents did not own a car, and they reported that their main reason for not owning a car was to save money or because they did not have a driving licence, while the percentage of respondents do without a car for environmental reasons was around 15%. The study also revealed that there is a strong link between knowledge about existing energy labels for cars and knowledge about the existence of associated tax-exemption schemes, which seems to point to a relevant role of economic incentives in influencing consumer choice. Findings from the survey also indicated that only a small percentage of respondents were members of a car-sharing club (5% in the Netherlands, 4% in Austria and 7% in Hungary), indicating a lack of dense infrastructure of car-sharing stations as the key reason for the relatively low membership rate. The study also found that high-income households are more likely to own a car than lower-income households.

The web of constraints operating in car mobility is thus complex and built on the interaction between regulations, economic incentives/disincentives, attitudes to transport, infrastructure, and inertia. Some of these causal loops are shown in Figure 11.2 below.

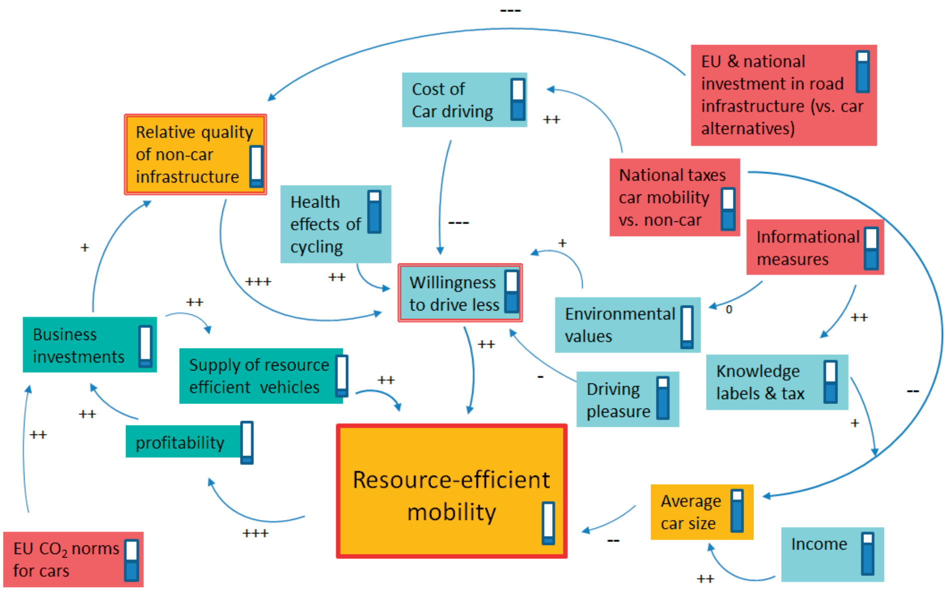

Figure 11.2 Web of constraints in passenger mobility. Legend: individual (blue), business (green), policy (red) and societal/infrastructural (orange) factors. The relationship between the factors is indicated (as positive or negative, varying from --- to +++). The level of the factor is reflected in the thermometer icons.

The analysis allows some conclusions to be drawn. The decision to own a car is influenced by the purchasing power of the prospective user but also by the extent to which ownership of a car of choice confers status benefits on a person (as a highly subjective element). Car purchasing decisions also depend on the infrastructural network aspects of roads available for use and the fuelling and charging infrastructure, and on personal attitudes to convenience, health, and, to a lesser extent, the environment. Regulations and policies were found to influence consumer choices by providing incentives to buy less polluting vehicles, but the same policies work out differently in different contexts. Tackling the web of constraints thus requires coordinated action in a number of policy areas, including technical standards, public transport networks, and transport infrastructures. Changes regarding attitude and inertia may follow changes in framework conditions but are also influenced by other factors such as the role of cars as status goods and the gratification of the experience of driving.

Innovation policy options for sustainability

The combination of the innovation framing analysis (step 1) and innovation dynamics analysis (step 2) was instrumental in helping us understand the difficulty of achieving more resource efficiency in passenger mobility and in delivering policy options for sustainable mobility (step 3). It found that sustainable mobility is not hampered by one or two factors but by a “web of constraints” and thus by “systemic blocking”. We found that effective policy (or very often policy *mixes*) needs to be mindful of this web of constraints, by aligning various policy instruments and avoiding policy inconsistency. Policy making should intervene not only on more objective indicators (such as price, density of infrastructure etc.) but also consider and shape perceptions (of e.g. sustainability), expectations, networks of actors, and potential strategic responses to policies.

Designing a comprehensive policy strategy for sustainable mobility requires systemic changes operating at different levels, including business models (which are committed to near-zero emission by 2050), mobility practices (e.g. combining car and public transport more often), and regulation. It therefore needs to combine “hard” policy instruments (such as taxing) with “soft” instruments such as public-private platforms.

11.3 Conclusions

This chapter has briefly explored the intricate web of factors preventing a more efficient use of resources, even when there seem to be opportunities to achieve win-win solutions. The concept of the web of constraints helps to understand the complexity of interlinked causal loops influencing consumer and business choices, which explain the low uptake of resource-efficient measures and lifestyles. The chapter used the mobility sector as an example, discussing it from the perspective of the web of constraints. This sector consumes large amounts of resources and generates significant environmental impacts, but also holds great potential to increase resource efficiency. The analysis has illustrated the complex web of obstacles that interact dynamically to prevent efficient use of resources. The notion of the web of constraints also helps to understand the complexity of designing policies that promote resource efficiency, as several areas need to be addressed in an integrated and dynamic way to overcome the web of constraints and modulate the dynamics into a web of drivers. The analysis also indicates important connections between different sectors, for instance between mobility and the building sector, since different types of housing options and planning strategies could give rise to new systems of mobility. Co-housing (people living together in an intentional community with the aim of sharing space and goods) and dense developments may favour the use of public transport and car-sharing platforms. The study has also noted that effective public transport networks are not sufficient to ensure less reliance on private cars, and that other factors, such as attitudes to convenience and adequateness, need to be considered. An analysis of the linkages across sectors and policy areas is beyond the scope of this paper, but these need to be addressed in the future to provide a basis for consistent and coherent policy mixes that help to overcome the web of constraints to resource efficiency.

Current policy measures to stimulate resource efficiency typically address barriers at the national, sectoral and company levels. However, policy *mixes* are necessary to deal with a myriad of barriers to resource efficiency and a circular economy. As the OECD (2007, p. 433) notes, “the complexity of many environmental challenges means that a mix of policy instruments will be needed … a well-designed instruments mix can be both environmentally effective and economically efficient.”

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Chapter 12

Sustainable development strategies: what roles for informal economy initiatives in the Post-2015 SDGs?

Paul Weaver

Abstract

Powerful and continuing processes of globalisation hold implications for the capacities of different sectors to contribute to wellbeing. Conventional thinking is nevertheless still focused on top-down strategies that seek to include and integrate people and places into the global capitalist economy. But, as a safeguard against the vagaries of the formal economic system, an important complementary approach could be to embrace and support bottom-up options for poverty relief and welfare delivery that operate outside the realm of the money economy. This implies recognising the role of the informal economy more explicitly and creating a facilitating context for social innovations that can play important roles in more sustainable development. This chapter frames the issues as a contribution to discourse over the Post-2015 Sustainable Development Goals (SDGs).

12.1 Introduction

This chapter considers the design of the Post-2015 Sustainable Development Goals (SDGs). It integrates four strands of inquiry to build policy recommendations: an analysis of the systemic causes of unsustainable development; an analysis of globalisation processes and how these are affecting both the powers of states and the balance between different societal sectors in their capacities to contribute to wellbeing; reflections on the increasing power and disruptive potential of the illegal economy; and, finally, some reflections on developments in the informal, social, and collaborative economies.[10] The chapter begins by providing a contextual overview of the governance challenge that SDG-design represents.

12.2 Context

The Millennium Development Goal (MDG) framework, which has been in place since 2000, will be succeeded in 2015 by a new framework of SDGs. Signatories to the MDG framework entered into a global partnership to reduce extreme poverty and committed to a set of time-bound targets with an achievement deadline of 2015. Despite progress on some issues, the international community will fail to reach most of the targets. While several countries achieved impressive rates of economic growth over the period for which the MDG framework was established (e.g. China and India), others did not. Further, the gains in terms of lifting people out of poverty are tempered by further widening of the gap between rich and poor, which has grown both between and within countries. Environmental change has also intensified. Competition for shares of the global commons has increased. Uncertainty has also increased.

Acknowledged strengths of the MDGs include the international focus they have given to poverty relief and to delivering more coordinated development approaches across a range of issues, as well as their establishment of simple, clear, often quantifiable, targets able to be monitored, leading to improved possibilities for advocacy and holding officials to account. The MDGs are credited with helping leverage up the levels of development aid funding, at least until the financial crisis hit in 2008. Acknowledged weaknesses include that the process through which the MDGs were developed did not consult stakeholders sufficiently, that the MDGs focus on goals without concern for how to achieve these, and the failure to underscore the MDGs with international human rights and environmental standards.

[10] The chapter is informed by work the author has contributed to two EC-funded projects: GLOBIS (Globalisation Informed by Sustainable Development) and TRANSIT (Transformative Social Innovation Theory). The author gratefully acknowledges funding and support received in the course of these projects. Usual disclaimers apply.

One important aspect when reflecting on these strengths and weaknesses is that during the period for which the MDG framework was established (2000-2015) the world has changed markedly. The global population reached 7 billion and has become predominantly urban. Economic power across the world has also shifted markedly. There have been major technological advances, especially in information and communications technologies, in genetic and nano-technologies, and in "smart" materials. There has been major social and political upheaval in some world regions. And, as referred to above, halfway along the MDG-timeline the world experienced a global financial crisis. As we come to the end of the timeline, perhaps what has changed above all else since its start is any sense that future development can be expected to be predictable along familiar trajectories. Continuity and predictability have been replaced by an outlook and likelihood of further dramatic change. Contextually, it is important to consider the role played in this by globalisation processes, as well as their roles as potential drivers of further rapid and unpredictable change.

12.3 Globalisation processes and sustainable development

There is a wide consensus that globalisation processes – the trends of greater interconnection and greater interaction across the world – have been among the most powerful forces driving, framing, and shaping development pathways and outcomes in recent decades (Stephen and Weaver, 2011). There is also a pragmatic realisation that globalisation processes have their own strong internal dynamics. This begs the question of how compatible ongoing globalisation processes are with sustainable development and its associated goals of greater equity among and between generations. This is far from a simple question. On the one hand, globalisation processes, especially economic globalisation processes, accelerate, scale-up, and extend the range and scope of impacts of *other* economic, technological, social, political, and cultural processes. On the other hand, globalisation processes also increase the variety and complexity of interactions in social-ecological systems and this introduces new relationships, new mechanisms, and new pathways through which impacts and outcomes of development processes can be produced.

In an increasingly globalised world the impact of every development decision and every policy intervention can reverberate throughout the ever more connected global social-ecological system. Especially when mediated through global markets, impacts of decisions, actions or policy interventions are therefore no longer limited to the sector, place, people, time, and scale of the initial source of change, but can cut across all these and become more embracing. Interaction, aggregation, and threshold effects all create further complexity, increasing uncertainty. The scale of impacts and the speed with which impacts develop are also affected and this holds whether impacts are positive or negative from a sustainability perspective. While at first sight this might appear as a “neutral” aspect of globalisation processes, there is an inherent asymmetry in the significance of scale and speed of positive and negative impacts when these affect social-ecological systems at risk of irreversible or catastrophic change; for example, if events outpace the capacities of people and institutions to respond appropriately, or if critical social or ecological thresholds are close to being crossed. At issue in these situations is that the downside potential of negative impacts is more significant for the concerns of sustainability than is the upside potential of positive impacts.

12.4 Globalisation processes and the changing balance of sectors

Globalisation processes, especially those associated with the spread of the neo-liberal regime of political economy, have contributed to a profound and accelerating erosion of state regulatory and fiscal powers. But these powers of states – and, therefore, the capacities of states in their traditional roles as guarantors of wellbeing – are also eroding because capital and the major corporations are no longer bound to be territorially grounded in any specific state jurisdiction. Furthermore, the erosion of states’ fiscal and regulatory powers is associated, also, with growth in the absolute scale of the illegal economy, which is estimated to now rival the scale of the legal economy in many world regions and to account globally for at least 20% of global GDP. This raises questions both as to the relationship between the legal and the illegal and the implications of the prominence of illegal activities for the sustainability of the global economy itself and for the successful pursuit of other dimensions of sustainability (Hudson, 2014).

While always present, illegal activity has expanded and become an integral part of the current phase of capitalist development. Illegal practices are present in routine production in factories and workshops, in the widespread theft of intellectual property, in the growth of counterfeit products, in a variety of exchange and trading activities and, crucially, in flows of money and money laundering activities in centres of global finance that convert money generated in illegal activities into legitimate money capital in the formal mainstream economy (Hudson, 2014). The laundering of money is of particular significance in the context of the systemic sustainability of contemporary economic arrangements. Money laundering principally occurs in Offshore Tax Havens (OTHs) established, originally, as spaces for permitted tax avoidance on the part of (relatively) small numbers of individuals and corporations not permanently resident or established in any specific national jurisdiction. But these have grown to become the sites of a majority of many of the financial transactions of the global economy: over 50% of international bank lending, approximately 33% of foreign direct investment, and 50% of global trade is routed on paper via OTHs which account for only 3% of world GDP (Christensen, 2011).

From one point of view the competitive success of particular companies and states and their economic sustainability is crucially dependent upon their involvement in illegal production and/or trading activities. From another viewpoint, illegal activities within production systems may threaten environmental, social, and political stability of the spaces in which they occur, while the burgeoning illegal practices in the financial sector threaten the systemic sustainability of global capitalism. Hudson (2014) argues that the major global financial crisis that erupted in 2008 "dramatically revealed that unfettered markets threaten the sustainability of the capitalist economy". Although full-blown economic depression was averted by state interventions, mostly in the form of printing money, the interventions only addressed the immediate symptoms. Such interventions can displace, but not abolish economic crisis tendencies. At the same time, a global ecological crisis is potentially imminent. "The prospect of the coupling of another economic crisis and an ecological crisis raises serious questions about the future sustainability of capitalism in its current form" (Hudson, 2014).

12.5 Sustainability governance and the SDG discourse

These aspects of globalisation processes pose major challenges for governance and for sustainable development. They are also highly significant for the challenge of agreeing Post-2015 Sustainable Development Goals. Whereas there is no dispute either over the symptoms of unsustainable development or over the need to address the systemic causes of unsustainability rather than continue to treat symptoms, stakeholders and interested parties hold many different perspectives on what the main systemic causes of unsustainable development might be and on how these might be addressed. By increasing social-ecological system complexity, globalisation is increasing the range of systemic diagnoses, the range of remedies being proposed, and, perhaps most importantly, the number of points in the social-ecological system where interventions could be used to achieve sustainable development ends.

Against the backdrop of these governance challenges it is important to reflect on how (and how appropriately) the discourse about the SDGs is being developed. A useful review of the discourse is provided by Benson (2013). She identifies six issues that illustrate some of the differences in perspectives on how the problems of poverty, inequality, and environmental degradation are diagnosed and how solutions are proposed. She sets out the different issues as a set of propositions concerning the systemic causes of unsustainable development. The problem is about:

- meeting basic needs: we cannot tackle everything, so we should concentrate on helping the poorest and most marginalised people and groups;
- projecting human rights: human rights are about more than just basic material needs, so we need to focus also on political participation, justice, peace, and good governance;

- restoring natural resources: the poor suffer most from degradation of natural resources and stand to benefit most from protecting our natural systems, so we should prioritise this;
- tackling inequality: there is enough to go around if we can only address inequalities, so we need to address income, gender, spatial, and trade inequalities as well as unequal access to natural resources and environmental services;
- growth and models of growth: economic times are tough and development aid is being withdrawn or is becoming less relevant in many countries, so we should support technological innovation, entrepreneurship, job creation, and growth, but along a new growth model that is greener and more inclusive; and
- better institutions: our institutions are weak, fragmented, biased and often self-serving or corrupted, so stronger political and market institutions would all help problems to resolve themselves.

[Source: adapted from Benson, 2013]

Benson points out that different problem diagnoses lead to very different suggestions for sustainable development goals. They can lead also to more fundamental disagreements over the role of a global framework and over if and how the connections between ecosystem health and poverty reduction can be tackled in a single and universal framework.

12.6 An alternative perspective

On the one hand, the discourse Benson describes helps set the scene for a *flexible* framework for the SDGs to come, a framework that is *pragmatic* about the changing geo-political context of shifts in the power balance between states and regions and that seeks to address problems of unsustainability in a *systemic* way. On the other hand, the discourse she describes is nevertheless framed largely by an implicit assumption of continuity of the present model of global capitalism. Here we argue that there is a need to reconceptualise the ways we think about how the wellbeing of citizens is secured and the roles and capacities of different sectors and activities in securing wellbeing. Conventional thinking is often focused on top-down strategies that seek to include and integrate people and places into the global capitalist economy. But, as a safety net and safeguard against the vagaries and potential collapse of the formal economic system, an important complementary approach could be to embrace and support bottom-up options for poverty relief that operate outside the realm of the money economy.

Briefly, such options include the informal and social (or alternative) economy and the emerging "zero marginal cost" economy.[11] This chapter focuses on the first of these.

The informal and social (or alternative) economy is a system of trade or exchange used outside state-controlled or money-based transactions. It includes barter and exchange of goods and services, mutual self-help, self-employment and subsistence activities. The informal economy has grown continuously in most developing countries, but it is now growing quickly also in developed countries, especially through more formal approaches to social innovation and more highly organised and networked activities of social entrepreneurs and social innovators. Time banking is an example of the kind of social innovation that holds potential to contribute to a new form of sharing economy and, through that, contribute to transformative societal change of the kind that may be needed if aspirations for sustainable development are to be met.

Time banking is a rule-based system of reciprocal service exchange that uses the time spent delivering or receiving service as a form of "complementary currency" (Weaver et al, 2015). The rules for service exchanges are based upon a set of core values and principles: inclusion, mutual respect (everyone has something to offer), reciprocity, and equality in the value of exchanged services. The services exchanged in time banks range in sophistication from the very simple, such as dog walking and car washing, to more complex arrangements, such as teaching piano or languages, and to sometimes sensitive personal services, such as child-minding or providing care and help to elderly people or people with disabilities. In time banking all services are valued equally whatever their level of sophistication or complexity. The unit of exchange and account for all services is the same. It is simply the hours spent giving or receiving service.

Time banking is based on a philosophy of building strong communities, providing care-in-the-community, and incentivising and rewarding community members for community service. Poverty, unemployment, and change in the types of skills and experience demanded in the economy are some of the ways through which the economic crisis comes in. For those with little money, the provision of a service is a way to obtain a return service of their own choice. For those without a job it is a way, *inter alia*, to contribute usefully to society, to be included in society, to maintain or establish a sense of purpose and identity, to develop contact networks, and to maintain or build skills and experience. But there is more to the time banking philosophy than this. It is

[11] The "zero marginal cost" economy (Rifkin, 2014) is part of an emerging collaborative economy that is being made possible because of technological advances that are reducing the marginal costs of production of some goods and services effectively to almost zero and that are enabling production to be decentralised and exchange of services to be arranged online. In combination with internet communication and social networking, these developments have already transformed some economic sectors, such as the information, recording and publishing industries, where there is no longer need for information to assume a material form. But the latest technological developments in decentralised energy production and 3-D printing, for example, are extending this to other areas of economic production. Individuals and localities can become producers and marketers as well as consumers and through these developments can completely by-pass conventional markets and their inherent systemic instabilities.

also about challenging prevailing paradigms and norms concerning the nature and source of wealth and social security (which time bankers see as lying in the abundant resources of people, their skills, and their time) and about changing the nature of relationships of individuals and communities with today's dominant systems from passive dependence on globalised market economies and state welfare systems to pro-active responsibility-taking and greater autonomy.

Definition is important in time banking. Time banking is not the same as barter, which is typically restricted to only two concerned parties. Rather, in time banking the giving and receiving of services is generalised within a community network. Also, time banking is not the same as volunteering, which is a one-way act of charity. In time banking, reciprocation – the giving and the receiving of services – is important, since the idea in time banking is that transformation at the level of the individual is based on reciprocity and occurs as much (if not more) from the vulnerability of receiving services as from the socially approved act in conventional volunteering of giving charity. Reciprocity is important also for building strong community relationships. Time banking values of inclusion, mutual respect, and equality are practised through reciprocal service exchanges and, thereby, are inculcated into new relationships between community members that the service exchanges entail. These are intended to strengthen intra-community bonds, achieving greater autonomy and self-reliance at the community level through greater interdependence among time bank members and greater use, sharing, and development of community-based (human and other) resources to meet individual and community needs. In turn this reduces individual and community dependence on dominant systems, such as the market economy.

For time banking protagonists the integrity of time banking in terms of its core values, principles, and the reciprocal service exchange mechanism is also important. It is the specific combination of the time banking values and principles as operationalised though the reciprocal service exchange mechanism that gives time banking its specific potential for transformative change. The espoused values of time banking stress cooperation, reciprocity, equality, abundance, self-worth, and self-reliance rather than those of competition, exploitation, scarcity-value, and dependence. Key here is that time banking values and principles are diametric opposites of those of today's dominant systems through which societal relationships are mostly established, i.e. the market and the state (professionalised) welfare system (Weaver et al, 2015). The market economy values scarcity, not abundance and works on competition, not cooperation, thus marginalising many people and excluding them from market benefits. In the understanding of time banking protagonists, the market economy gives rise to "throwaway people", especially under economic globalisation and hegemonic neo-liberalism, so the time banking mantra is "no more throwaway people". Likewise, the professionalised state-provided welfare system is increasingly overstretched, ineffective, and inefficient, and cannot be relied on to secure everyone's welfare. Similarly many public services (e.g. criminal justice) struggle to achieve their missions, so these are not assured either. Time banking is thus seen by its proponents to be a mechanism for routinising and institutionalising the practice of a personally and community-constructive set of values that can counter the values that are institutionalised in the market and in state welfare systems, which are often seen by time banking protagonists as destructive to the well-being of individuals and communities.

12.7 Conclusions

The state as "first" sector is conventionally viewed as responsible for furnishing protection, security, and continuity. As regulatory authority it holds powers to regulate the other sectors. Business as "second" sector is motivated by profit, is incentivised to produce and market goods and services, and is subject to both the forces of market competition and to state regulatory and fiscal controls. Civil society as "third" sector involves voluntary collective action around shared interests, purposes, and values. But in addition to these conventionally recognised sectors there are at least two other, less well-recognised sectors of activity, the informal economy and the illegal economy. An important consequence of globalisation processes has been the change in the balance of these different sectors of activity and, especially, in state capacities to continue to act effectively in its traditional role as guarantor of wellbeing. Albeit that the market has grown in importance and, de facto, has become the major mechanism for delivering answers to the basic economic questions of what to produce, how and for whom, there are systemic biases in allocative mechanisms. These are no longer as readily addressable through redistributive mechanisms of development aid or payment of welfare benefits, which are undermined as state fiscal powers erode. Simultaneously, the sustainability of the global capitalist model is jeopardised by the very lack of financial regulation that the neoliberal politico-economic regime espouses.

An important implication that might be drawn, then, concerns a need for the SDGs to embrace options beyond the scope of poverty relief efforts that focus heavily on integrating people and places into the capitalist market economy. In developing the SDG framework a diversified approach placing stronger emphasis on supporting bottom-up approaches to poverty relief being developed beyond the state and outside the formal capitalist economy could therefore be an appropriate complement to approaches that, in the face of decline in the role of the state, seek predominantly to integrate people and places into the global market system even when this could be at risk of systemic failure. Such bottom-up approaches within the informal economy include: the non-money (complementary currency) economies, the collaborative and "sharing" economies, and the emerging "zero marginal cost" economy, all of which illustrate scope to relieve poverty and deliver wellbeing outside the formal economy in ways that are cushioned from the vagaries and arbitrariness of dependence on global markets or the state and are also legitimate and legal. Potentially, these may be able to offer shelter from the shocks and crises likely to afflict global markets and global capitalism in the period ahead.

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Chapter 13

The role of cultural diversity in sustainable development: a case study of three villages in Shaanxi province

Jing Wang and Harro van Lente

Abstract

This chapter examines the relationship between cultural diversity and sustainable development. Culture and cultural diversity have been acknowledged as an intrinsic part of sustainable development, and can be studied fruitfully in rural areas of China. With urbanisation proceeding at unprecedented rate, the rural culture is being torn between traditional and modern values, beliefs and practices. Our study explored five pathways by which traditional rural culture relates to modern culture (essentialising, alternating, converting, hybridising and innovating) in three cases studies in the villages of Dong He, Dai Jia and Chi Niu Wa in the Shaanxi province of China. Detailed information was obtained using interviews and field observations. We concluded that instead of a monolithic shift to modernity, multiple pathways are being followed. This offers new outlooks for the challenge of sustainable development.

13.1 Cultural diversity and sustainable development

Culture is possibly the most difficult word in English to define (Schech & Haggis 2000), and the definition of culture differs between places and among individuals (Daskon, 2010). In the field of anthropology, the basic assumption of cultural studies has changed profoundly. Some decades ago, Wallace concluded that the majority of anthropologists saw cultural knowledge as the replication of uniformity and assumed that people shared the values and practices of their specific social community (Wallace, 1970). Today, the prevalent assumption among anthropologists is that culture is constructed by a variety of small events (Weisner, 2009). The basic assumption, inspired by Clifford Geertz, is that culture is active and can be changed by any small event (Geertz, 1973).

Sustainable development is closely intertwined with cultural diversity all over the world, and major cultural changes may generate a paradigm shift towards sustainable development (Hivaki, 2012). Cultures change as a result of exchanges, conflicts, and innovation in human society, reinforcing cultural diversity (Montuori 2010). In particular, the change from traditional to modern conditions has put pressure on cultures to change. Chan (2002, 2005) studied the dynamics of the "cultural contact" and proposed five possible pathways, called essentialising, alternating, converting, hybridising, and innovating. Chan used this to examine cultural contacts and cosmopolitanism from the basic viewpoint of transnationalism (Chan 2002). In this chapter, we continue this line of research and examine the tensions and opportunities of traditional culture and modern culture at the village community level in China. Tradition is the past of humans, forming gradually in their social life and mind throughout their lives (Luo 2006). However, with the rapid modernisation and urbanisation of China, economic development is becoming the main paradigm of the social value system.

Cultural diversity also reflects human nature in terms of biodiversity (Rio de Janeiro, 1992). Since humans belong to the category of living creatures, one may argue that human cultural diversity is embedded in the overall biodiversity system (Liu 2011). The extinction of several species has raised the level of interest in the protection of biodiversity. However, it is difficult to draw up a clear definition of diversity, due to the intrinsic and implicit value of diversity (Heyd, 2010), and this also holds for cultural diversity. A culture may be seen as representing a particular type of gene which is helpful for the potential development of the world (Zheng 2005). The loss of traditional cultures will increase the risk of environmental and ecological problems (Ausable 1994, p211). It is clear that the preservation of cultural diversity and the protection of traditional lifestyles have a beneficial effect on maintaining the balance between humanity and nature (Liu 2011).

The role of cultural diversity in sustainable development is complex, intricate, and ambiguous. Since sustainable development links society, economy, and ecology (Baker, 2006) in a systemic and complex way, we argue that the cultural dimension is also one of the most pivotal factors in sustainable development, which will directly and indirectly decide whether sustainable development can be achieved. The cultural dimension is a "missing pillar" and should be more effectively incorporated in the sustainable development discourse (Burfort et.al. 2013). After all, sustainable development is not just a political or economic topic. We are challenged to change our thinking, our practices, and our beliefs (Pan, 2008). Various studies have explored sustainable development from the perspective of economic development or from the perspective of government (Ma, 2009), but there is less literature available about the *culture* of sustainable development. This chapter addresses the cultural aspect of the process of sustainable development, and seeks to integrate culture theory and sustainable development in the context of agriculture.

13.2 Case study: three villages in Shaanxi province

Villages use most of their traditional knowledge, traditional customs and rites, traditional ideas of relationship, and traditional inner world to satisfy their daily needs (Daskon 2010). Because of the rapid urbanisation, modern culture coexists with traditional rural culture in the rural community. This allows us to consider the relationship between cultural diversity and conservation at the level of local or indigenous communities (Brosius and Hitchner 2010). Our research project studied the cultural diversity in three villages in Shaanxi province at the community level: Chi Niu Wa, Dai Jia, and Dong He.

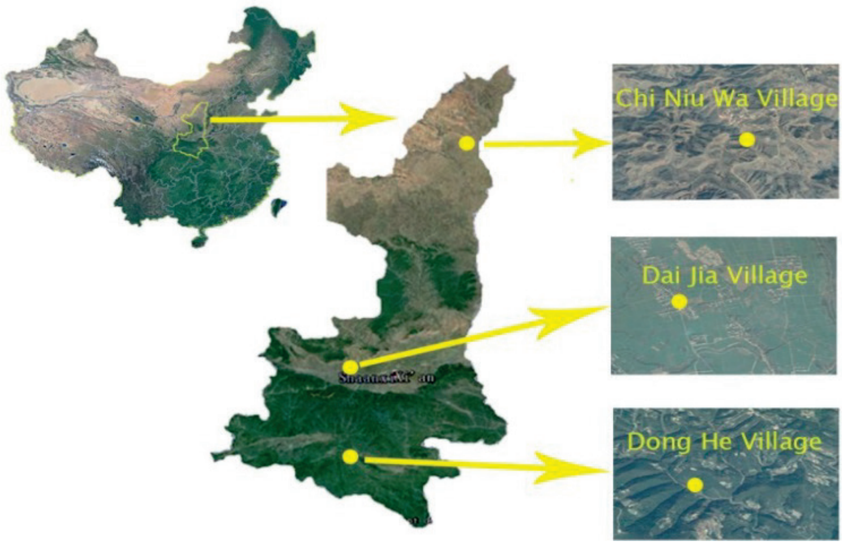

Figure 13.1 The location of three case-study villages in Shaanxi province

Shaanxi province is the cradle of Chinese agricultural culture. In terms of geographic characteristics, the province is divided into three parts (see Figure 13.1): the northern Shaanxi Loess Plateau, the Guanzhong plains (central part of Shaanxi), and the southern Shaanxi Qinling Mountains. The significantly different topographic conditions mean that farming activities differ between these three parts. Hence, we selected three villages from different parts of the province as case studies: Chi Niu Wa, Dai Jia and Dong He. We examined how the unprecedented urbanisation and modernisation led to each of these places having their own distinct way to adapt to the changes in society. Detailed information was obtained using interviews and field observations.

The most significant similarity between these three villages is the popular phenomenon of villagers becoming migrant workers working outside the villages in cities and urban areas. According to the Chinese national bureau of statistics (2012), China's urbanisation rate increased rapidly from 21% in 1982 to 52.7% in 2012. At national level, the trend among farm labour is towards old and female; while the migrant workers are young and male (see Table 13.1). In addition, the agricultural labour structure changed profoundly in all three villages. In traditional China, the characteristic of Chinese rural life is "man ploughing and woman weaving" (Fei, 1939), which has now been replaced by "man working elsewhere and woman farming in the village". There are several causes of these extremely significant changes. First, the development of agricultural science and technology has reduced the involvement of human labour. The net time spent on agricultural work has been reduced from 8 (Fei, 1939) months to 2 or 3 months a year (information from our field research in three villages). Before 1978 (the time of China's reform and opening-up), qualified male labourers were land-bound and engaged in physically demanding farming activities. However, with the rapid urbanisation, the majority of young people chose to work in cities as migrant workers, to improve the whole family's income, as the net agricultural income was meagre (He, 2013). The identity of qualified young rural labours thus changed from farmers to urban migrant workers, while unqualified labourers stayed in the village to do agricultural jobs. In previous times, agriculture was the core task of a farmer and the pivot of their attention; now, rural household income is mainly derived from villagers working in cities as migrant workers.

Table 13.1 Gender and age of agricultural labour and urban migrant labour in China

Percentage	Agricultural farmers (348.7 million)	Migrant workers (131.8 million)
Gender		
Male	46.8%	64%
Female	53.2%	36%
Age		
Below 20	5.3%	16.1%
21-30	14.9%	36.5%
31-40	24.2%	29.5%
41-50	23.1%	12.8%
Above 50	32.5%	5.1%

(Source: Chinese Second Agricultural Census[12] 2006 and data collected by the first author)

In all three villages, intergenerational income is the crucial component of rural income (see Table 13.2), reflecting the difference between the old generation doing farming work in rural villages and the young generation working in urban areas (He, 2013). Young male adults work in cities, while children, women and old people stay in rural areas. With the rapid urbanisation, the rural culture is torn between traditional and modern values, beliefs, and practices.

Table 13.2 Village population and urban migrant workers in three villages

Village	Village population	Households	Migrant workers (approximate)
Dong He village	1730	453	300
Dai Jia village	1367	321	210
Chi Niu Wa village	1008	254	120

13.3 Five pathways in three villages

All three villages we studied are marked by major tensions between traditional and modern cultures. Yet, their coping strategies are not necessarily the same. To explore possible differences we use the framework proposed by Chan (2002), who distinguished a departure culture and an arrival culture to formulate different pathways for each of these two (Chan 2002). By delineating pathways of culture contact, we examined various forms of tension between modern culture (M) and traditional culture (T) at the level of rural communities, thereby assessing the opportunities and risks for sustainable development. In each village, multiple pathways are being used, instead of a monolithic

[12] The first and second agricultural censuses were carried out in 1996 and 2006, respectively.

shift to modernity. Below we introduce the five pathways and discuss how they relate to our three villages.

Essentialising (T+M=T)

In the first pathway, local villagers identify closely with their traditional conventions, religious beliefs, moral values, and rites. Farmers insist on their own identity symbols and resist the invasion of modern culture, externally and internally. Therefore, although urbanisation and modernisation are continuing apace, people raise their inherent awareness of conserving the intrinsic value of traditional culture without being impacted by powerful modern cultural attributes. Despite the penetration of modern culture, the norm for traditional culture is gradually essentialised and continues to play a crucial role in local farmers' daily lives.

Although China is now rapidly becoming urbanised, some traditional values also play pivotal roles in guiding farmers' decisions. For instance, people's commitment to the collective is deeply rooted in all three villages, which means that the interest of the family as a whole dominates over each individual's interests. The young and old generations support each other in the interest of the whole family. In addition, indigenous knowledge is recognised and maintained. For example, in Dong He village, indigenous ecological knowledge is passed down from generation to generation. Specifically, the organic rice project in Dong He village is constructed under the guidance of the traditional system of "rice-duck mutualism" "Rice-duck mutualism" originated around 400 years ago (at the end of the Ming Dynasty or the beginning of the Qing Dynasty), and aimed to develop the multifunctionality of a paddy field. In Chi Niu Wa village, local villagers built their own folk museum to record traditional and vanishing farming culture, to tell and educate people about what worked in the past.

Alternating (T+M = T/M)

The second pathway is to alternate modern and traditional culture. The migrant workers, for instance, are working in urban areas and experience modern culture in the cities, while their collective traditional culture also influences their attitudes and behaviours. Peasant farmers working as migrant workers in cities and urban areas see their rural home as their "root" and intend to return there in the future. Thus, to some degree, both modern values (working outside the village, money-oriented values) and traditional culture (family or local code of traditional values and indigenous knowledge) are internalised in peasants' lives, and their roles alternate during their lives.

Converting (T+M = M)

In this pathway, modern culture appears as a dominant force, and modern values dominate the value paradigm globally, resulting in a tendency for local communities to lose and shift their identities. Traditional culture assimilates with modern culture, but modern culture is so strong that it replaces traditional norms and values. As Chan illustrated, people will bury their “old self” (Chan 2002) and pursue their values in life within the context of modern culture.

In Dong He village, farmers currently do not want their children to be farmers and live in rural areas. And most young farmers (i.e., those aged between 20 and 40 years, as well as male farmers under 50 years old) choose to work in cities to increase the household income. In addition, money orientation dominates farmers’ values and behaviour. In order to improve their crop yields, farmers in all three villages are becoming more and more dependent on chemical products (fertilisers and pesticides). In Dai Jia village, the majority of farming activities are carried out by machines, replacing manpower. For instance, local farmers use agricultural machines to sow, perform rotary tillage, and harvest. In addition, there have also been changes in the farmers’ values in life. For instance, in Chi Niu Wa village, all interviewees expressed their support for building the local folk museum because this would increase their income. Monetary value plays a pivotal role in the farmers’ views and behaviours. Local farmers thus emphasise the instrumental value and echo the modern view that acquiring money is an end in itself (Simmel 1978[1900]).

Hybridising (T+M = TM)

In a fourth pathway, new hybrid arrangements emerge. To support their local communities, young adults (i.e. those between 20 and 40 years old and male farmers under 50 years old) choose to work outside the village to help sustain the expenditures of the whole household. Migrant workers are typically profoundly affected by modern culture. There will be tensions between people who insist on traditional values and people who embrace the idea that modern culture is more advanced. The conflict is inevitable, and the collision will initially be severe. However, as daily life continues in rural communities, there will be some common ground where these two types of culture coexist. Hybridisation is not without its problems; there are risks of problems regarding social order and integration, such as suicides and gambling (He, 2013), as the new cultural order has not been comprehensively established, while the old cultural order is no longer effective (He, 2013).

Innovation (T+M = NC new culture)

The final pathway relates to the possibility of innovation. Traditional culture and modern culture are interdependent and interact with each other, deciding farmers' rural lives and the development of local communities. Local villagers will evaluate their behaviours from the perspectives of both traditional culture and modern culture, thereby drawing lessons and ideas from both cultures to solve problems in this changing society. For example, indigenous ecological knowledge is needed to limit the dominance of "economic growth" behaviour, while modern knowledge can provide scientific guidance to traditional agricultural production. This results in a type of innovative culture that integrates traditional local culture and modern culture, and solves problems in a changing society. In Dong He village, for instance, there is an organic farming project organised by the government, guided by experts and implemented by local farmers, which integrates indigenous agricultural knowledge ("rice-duck mutualism") and scientific knowledge (such as an insect killing lamp).

13.4 Conclusion

In this chapter we have examined the relationship between the diversity of rural culture and sustainable development in rural areas in China. We have argued that there are multiple pathways from traditional culture to modernity, each with their own opportunities and pitfalls. We have thus outlined a dynamic that differs from that of a singular, monolithic transition. The five pathways that we investigated in three villages in Shaanxi province echo the basic tension that Max Weber recognised between two opposite modes of action: "*wert*-rational and *zweck*-rational". Wert-rational refers to a value-driven mode of action, in which actions are decided by cultural beliefs such as ethics or religion; zweck-rational means goal-oriented and instrumental action, utilitarianism, and a means-to-ends rationality (Smith 2001). Our case studies show that the two may merge in various ways. Together, the five pathways show that cultural diversity in general, and the ways to integrate traditional and modern cultures, are crucial for farmers in their efforts to adapt to a society in transition. Cultural diversity is thus an important condition to address the many challenges of rural sustainable development.

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Chapter 14

Governance of religious diversity

Laura Kurth

Abstract

While Western Europe seemed to have found a relatively stable equilibrium between minority rights and majority interests after the Second World War, immigration and nationalist movements have lately produced tensions. The Islamic minority in particular is experiencing a rejection of its cultural expressions. This chapter assesses how cultural diversity can express itself in the contestation of value claims, and what this implies for the opportunities given to religious minorities to substantiate their identity. It uses halal food production and consumption in the Netherlands as a case study of contested religious practice. In the debate about ritual slaughter, politicians found it difficult to determine their position amidst fundamental questions regarding religious freedom, and sought certainty in legal, political, scientific, economic, and historical arguments. Private governance of halal food production has led to a range of halal certifiers at different societal levels that lack cohesion, while meta-governance efforts suffer from similar fragmentation.

14.1 Introduction

Sustainability is often associated with environmental protection. However, the word "sustainable" intrinsically denotes "the long-term self-supporting viability of any type of system (Throsby, 1997)", and may thus apply to the persistence of ecosystems as well as the economic and social system. An aspect that has been rather neglected by sustainability science is the cultural system that sustains societies. Yet this system is of vital importance for the functioning of any society. Ever since the spread of humankind and the development of trade, virtually all societies have been multicultural, and tensions have occurred between different cultures. While Western Europe seemed to have found a relatively stable equilibrium between minority rights and majority interests after the Second World War, immigration and nationalist movements have produced tensions between the values of cultural minorities and those of secular society in recent years. The Islamic minority in particular is experiencing a rejection of its cultural expressions. The veiling of women, building of minarets and ritual slaughter are only a few of the Islamic practices that have been contested by politicians, the media and civil society. Cultural diversity is an important asset to any society, but perceived incompatibility can lead to destabilisation of the cultural system underpinning any sustainable society. Therefore this chapter assesses how cultural diversity can express itself in the contestation of value claims and what this implies for the opportunities given to religious minorities to substantiate their identity. It used halal food production and consumption as a case study of contested religious practice. The research context is the Dutch parliamentary debate, where the production of halal food has been fiercely contested, and the halal food industry which took over the task of ensuring halal food production.

14.2 The importance of the cultural dimension of sustainable development

Burfort, Hoover et al. (2013) advocate the incorporation of the cultural dimension of sustainable development in the sustainability discourse, and present an overview of the sparse available literature regarding cultural approaches to sustainable development. Some of this literature advocates a cultural-aesthetic dimension, claiming that cultural vitality is a basic requirement for a healthy society (Hawkes, 2001), that respect for cultural diversity, identities, local language, and cultural integrity is crucial, and that open dialogue should be promoted. Others argue for a political-institutional dimension, which encompasses organisations as well as institutional norms and formal rules and procedures. Proponents of a religious-spiritual dimension of sustainable development acknowledge the need for a moral and spiritual shift in order to initiate a transition towards sustainable development (Burford et al., 2013).

UNESCO supports the view that as an underlying dimension, the norms, values, and moral ideas of society influence all three pillars of sustainable development, i.e. the ecological, economic, and social pillars. The ecological pillar is influenced by ethical considerations about the use of technological innovations (e.g. For example, whether the application of technology to influence human or animal genetics should be regulated by setting moral boundaries). The economic dimension of sustainable development also needs ethical considerations, since the dominant consumer culture is exhausting our resources. In a social context, shared values are needed to resolve conflicts and to strive towards a sustainable society (Leo, 2012). In the discussion regarding sustainable development goals, as the successor to the Millennium Development Goals (MDGs), UNESCO has proposed cultural sustainability as an independent pillar of sustainable development to ensure inclusive social development. Culture could contribute to this objective by creating a sense of membership and belonging, enhancing tolerance, mutual understanding, and trust between different societies, while acknowledging diversity. Furthermore, it could foster common resource management through the use of social capital, and stimulate innovative learning (UNESCO). This approach to a cultural dimension of sustainable development is picked up below and further elaborated for the case of tensions relating to multiculturalism in Western Europe.

14.3 Tensions regarding cultural diversity in Western Europe

It is especially since the 1960s that Western Europe has seen a regular influx of migrants from different cultural backgrounds. Many post-war labour migrants and later refugees came from Turkey and Northern Africa, and brought with them Islamic values, lifestyles and practices. Yet even these Islamic traditions are not homogeneous, but mixed with ancient local traditions of the home countries. These elements necessitated ways of dealing with this cultural difference as opposed to the European Judeo-Christian tradition and the recently developed secularism. According to Grillo (2007), multicultural societies in Europe have gone through three phases in the governance of diversity. In the late nineteenth to mid-twentieth centuries, cultural differences were denied and migrants were assumed to assimilate under the regime of strong nation states. Assimilation required a seamless integration, whereby the migrants “accept and internalise the values and culture of the dominant group” (Scott & Marshall, 2009, p. 27). However, people were unwilling or unable to completely accept and adapt to the dominant culture, and during the second half of the twentieth century, integration was actively stimulated. The claims of diversity became recognised and racism was criticised (Grillo, 2007). The term integration was redefined by Roy Jenkins (1967), former UK Home Secretary, who explained that equal opportunities and cultural diversity in an atmosphere of mutual tolerance are needed, but not easily achieved. In fact, attaining this goal has become even more difficult in an era when the governance of diversity is being criticised and the value of certain lifestyles is being questioned. Some even argue that multicultural societies in Europe are becoming too diverse to ensure social cohesion (Grillo, 2007). This growing tension in the third phase of multicultural governance is sparked by nationalist movements which claim that a homogeneous, established and unchangeable European culture of tolerance and secularism is being challenged by a homogeneous, religious, intolerant and unchangeable ideology, that of Islam. Both representations are wrong, since cultures are neither homogeneously accepted by all members, nor are their values unchangeable. This flexibility of cultures makes it possible to find policy compromises in culturally diverse societies. What these compromises look like, however, depends on the governance setting and the policy options considered by different actors. The next two paragraphs show two different contexts in which actors tried to facilitate the expression of culturally diverse identities. The first example is the debate about a ban on non-stunned ritual slaughter in the Dutch parliament, in which conflicting cultural values led to a different framing of the problem and possible solutions. The second example shows how the Dutch halal food industry tries to ensure the production of halal food for the heterogeneous Islamic minority.

14.4 The politics of ritual slaughter

In 2011/12 a fierce debate took place in the Dutch Parliament regarding a bill which would have resulted in a ban on non-stunned ritual slaughter. While some topics were unanimously agreed upon, others led to diverging "frames". Frames are constructs of meaning that represent value claims and guide the policy discourse by assuming a specific problem, promoting a particular solution, and motivating actions (Entman, 1993). In the course of the debate, these frames changed from polarised initial frames in the Lower House towards more inclusive and moderate frames in the second term of debate. Yet, the polarisation of frames increased again in the Upper House, with animal activists confronting religious compromise seekers. All parties agreed that animals should not undergo unnecessary suffering during the slaughter process. Moreover, they acknowledged that ritual slaughter covers only a small share of the Dutch meat production compared to intensive meat production processes, whose practices are frequently criticised. It was also agreed that current meat labelling practices are insufficiently informing the consumer. The export of non-stunned meat was criticised as drastically increasing the scale of Dutch non-stunned meat production. Finally, all parties acknowledged that a prohibition of non-stunned ritual slaughter may shift production to neighbouring countries or to the black market, although the animal rights party was less explicit about this issue than other parties. The main question was whether animal welfare and religious views on ritual slaughter are compatible. Within the framework of this question, fiercely debated topics included the significance of religious freedom and animal welfare, the use of science, the compliance of the draft bill with the European Convention on Human Rights as well as the Dutch constitution, and the participation of religious groups in decision making.

At a superficial level, the debate dealt with the confrontation between the religious values underlying non-stunned ritual slaughter and the secular values of the protection of animals from what was seen as unnecessary suffering. At a deeper level, however, the debate touched upon more essential questions concerning the opportunities that should be given to minorities to substantiate their religious and cultural identity: to what extent do minorities have the right to implement their practices and to what extent do the majority of the population have to respect these rights? Should religion play a role in the public domain and to what extent should religious practices be regulated by secular states? Throughout the debate, most politicians found it difficult to position themselves amidst these fundamental questions and sought certainty in legal, political, scientific, economic, and historical arguments.

Although the Dutch constitution, as well as the European Convention on Human Rights, provides guidance on balancing majority interests and minority rights, the interpretation of these laws is up to the politicians. The political game influences decision makers as institutional arrangements can lead to different frames, lobbyists influence individual policy makers, and the willingness of religious groups to cooperate may make laws obsolete. Science has the ability to provide knowledge, but conflicting results may ensue and scientists cannot provide the moral considerations to decide between various policy options. An export-oriented country such as the Netherlands also always has to keep its economic interests in mind, and there was the danger of a spillover of stricter animal welfare regulations from the relatively small-scale ritual slaughter to the entire meat industry. The historical perspective played a role in the debate about the ban on ritual slaughter, as it would affect not only Muslims but also the Jewish community, who had already experienced a ban on their slaughter method during the World War II. Although a political majority decision was taken at the end of a long process of debate, this was a compromise that left the controversy and its related uncertainties undecided (Kurth & Glasbergen, 2015a). The next section illustrates how in the absence of government regulations, the demand for halal food by Dutch Muslims is being met by the halal food industry.

14.5 The fragmentation of the halal certification market

While the globalisation of the food industry is increasing the availability of ethnic foods in Europe, it also poses challenges to the right of Muslims to express their identity through halal food practices. Long production chains increase the risk that halal food gets contaminated through contact with haram products. This is especially problematic because halal is a credence quality attribute, meaning that the process of food production is very important for the halal worthiness, which cannot be assessed by analysing the final product (Bonne & Verbeke, 2008). An additional challenge is the anonymity resulting from long production chains, which makes trust-based purchases almost impossible and auditing extremely complex. This is where halal certification appears to create transparency in the market and to enhance consumer choice.

In the Netherlands there are five larger halal certification bodies and many small local certifiers. Qualitative interviews with them have shown that the market for halal certification is fragmented, due to its nature and due to differences between the halal certifiers. The Dutch halal certification market is large enough to accommodate several certifiers. Moreover, market entry is relatively easy and suspected fraud motivates new certifiers to enter the market. The certifiers themselves differ very little as regards halal standards and the procedures they use. Yet, they have different ethical backgrounds and not every certifier is equally recognised by Islamic states for export. Finally, different approaches are used to acquire legitimacy, ranging from low prices to religious involvement of Imams. This fragmentation of the Dutch halal certification market (see also Box 14.1) creates challenges regarding the mutual recognition of certifiers during the certification of processed food. Moreover, laxness with regard to monitoring the standards and procedures may hamper a level playing field. The certification of export goods is also complex and obscure. Moreover, the variety of halal certificates creates confusion among consumers.

Box 14.1 Fragmentation of the Dutch halal certification market

- Certification competition
- Easy market entry
- Suspected fraud
- Different standards
- Different procedures
- Different ethical backgrounds
- Different export recognitions
- Different forms of legitimacy

A meta-governance body has been advocated in order to check the certifiers and create a universal halal standard. An analysis revealed, however, that efforts to achieve international harmonisation of halal standards have created another fragmented system at a higher level (see Box 14.2). The different meta-governors, such as the World Halal Council, the World Halal Food Council, the Standards and Metrology Institute for Islamic Countries and the Halal Working Group of the European Committee for Standardisation, also use different standards and procedures. An entanglement of political, economic, and religious interests of Islamic states such as Indonesia, Malaysia, and the Gulf states is at play here, and there are different sources and degrees of support for these initiatives. The European Committee for Standardisation in particular lacks legitimacy among Dutch certifiers due to its non-religious approach to halal standards (Kurth & Glasbergen, 2015b).

Box 14.2 Fragmentation of the halal meta-governance market

- Different standards
- Different procedures
- Non-religious approach
- Political, economic, and religious power preservation
- Different sources and degrees of support and authority

14.6 Conclusion

The aim of this chapter was to assess how cultural diversity can express itself in the contestation of value claims and what this implies for the opportunities given to religious minorities to substantiate their identity. We have found that politicians involved in a political debate find it difficult to position themselves with regard to essential questions such as the extent to which minority rights should be protected, and whether the state should intervene in religious practices in the interest of secular majority values. As a result, religious practices concerning food standards have remained largely unregulated in the Netherlands. This is problematic, on the one hand, with regard to the unsolved policy controversy, and on the other hand, in the light of globalisation leading to complex production processes that increase the risk of cross-contamination between halal and haram food, which is not regulated either. Halal certifiers try to introduce more transparency into the market, but the fragmentation of the certification market as well as the meta-governance market leads to another layer of interwoven interests and uncertainty for halal consumers.

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Part IV
Sustainable development research at ICIS: the political-institutional dimension

Chapter 15

Global governance of fair labour: consequences of institutional change

Ceren Pekdemir

Abstract

The policy domain of fair labour is undergoing crucial institutional changes with the advent of private actors and the emergence of new governance mechanisms and instruments. This chapter addresses the main changes of the past decades in the field of international regulation of fair labour rights and working conditions, and also evaluates the consequences of private standards setting in terms of responsibility, accountability, and power (re)distribution. This chapter proposes that the institutional changes do not only embody a shift from public to private responsibility for the development and enforcement of labour laws and regulations, but also imply a new division of powers between governments, businesses, and civil society. It concludes that the complementary shift from private responsibility to private accountability has yet to occur.

15.1 Introduction

From the 1990s onwards, an unprecedented surge has taken place in the renewal of policy practices, as state-centered international regimes were unable or unwilling to address many of the most pressing global problems, such as global climate change and ecosystem degradation. This stimulated the development of new institutions, partnerships, and governance mechanisms (Lemos & Agrawal, 2006). The concept of global governance has come to denote the various forms of steering by state and non-state actors (such as business and NGOs) that regulate (or attempt to regulate) actions or events that transcend national frontiers concerning individuals, states, corporations, or other groups. As regards sustainable development, governance refers to processes of socio-political governance to the extent that these relate to steering societal development along more sustainable lines (Meadowcroft, 2007). A case in point is the advancement of labour rights in global governance. Several institutional changes are taking place in this policy domain, including the advent of new actors that play new roles, and the emergence of new governance mechanisms and instruments. In this chapter we define institutional change as the modification or renewal of regulatory practices from one set of institutionalised arrangements to another.

The changing institutional landscape not only raises questions of how developments are actually taking shape in practice, but also raises normative concerns. Central to this chapter are the normative issues of responsibility (which is about taking ownership over issues), accountability (which is about being liable for one's actions), and power (re)distribution (which is about the spread of control and authority). At the heart of this inquiry lies not only a functional approach to the manageability of the issue at stake, but also concerns about the desirability of the consequences of the institutional change. This chapter firstly addresses the main changes of the past decades in the field of international regulations on fair labour rights and working conditions, and secondly evaluates the consequences in terms of responsibility, accountability, and power (re)distribution.

15.2 Institutionalisation of international labour laws and regulations

The creation of the International Labour Organisation (ILO) was part of the Treaty of Versailles that ended World War I in 1919. It was the first and most important regulatory institution that went beyond national borders for the regulation of labour. After the demise of the League of Nations by the end of the Second World War, the ILO became the first United Nations (UN) agency. Presently, the ILO has 185 member countries and until this day it continues to be the most authoritative norm and standard setting body on the international level that is dedicated to the promotion of social justice and internationally recognised human and labour rights. Its tripartite governing structure enables workers and employers to have an equal voice with governments in its deliberations. However, since each member country is represented by two government delegates (an employer delegate and a worker delegate), governments offset worker and employer voting capacity in voting procedures. The labour rights are incorporated in a total of 189 conventions, including core rights such as the prohibition of child labour and forced labour, non-discrimination and equal pay, freedom of association, and collective bargaining. Among the 189 conventions, eight are fundamental conventions that relate to the core rights, and these are binding to all member countries. The remainder of the conventions become binding upon ratification by the member countries. The ILO's supervisory system is responsible for ensuring the implementation of conventions through social dialogue and technical assistance. In the absence of an international court of labour rights, the legal enforcement depends on the jurisdiction of domestic courts. As a result of the principle of non-intervention in nation-state sovereignty and the influence of national self-interests on the ILO, the organisation does not impose sanctions on governments (Scherer & Smid, 2000). Conventions are far from being fully institutionalised in many parts of the world, and because of this even core labour rights continue to be breached in many parts of the world (Helfen & Sydow, 2013). The lack of enforcement mechanisms is a serious shortcoming in the power of the ILO.

The problem of unfair labour practices transcends national borders, as we live in a world that is globalised through transnational production and procurement processes and consumption patterns. Not infrequently, large companies source from networks of global suppliers without legal obligations (Barrientos & Smith, 2007) and commodities are produced in long value chains where labour costs are often incurred from the workers at the end of the chain. In the wake of the controversy surrounding sweatshop practices and concern regarding labour conditions in developing nations, private initiatives have attempted to fill this regulatory gap in the field of fair labour.

The main goal of improving labour conditions was primarily advanced by the creation of codes of conduct and corresponding monitoring practices. By creating voluntary, transnational regulations, these initiatives sought to function along the lines of outsourced production, striving for more companies to have value chains with better protection of labour rights. Some of these arrangements are intra-sectoral and solely have partners from civil society or the market domain. Others are multi-stakeholder, including actors form both domains, also referred to as intersectoral partnerships (Bitzer, Glasbergen, & Leroy, 2012), cross-sector partnerships (Selsky & Parker, 2005), or co-regulation (Steurer, 2013). At present, there are various private arrangements that are engaged with setting transnational fair labour standards (see Table 15.1). Most of these organisations also monitor compliance and disseminate information and training programmes to businesses. In the meantime, numerous organisations have arisen that either serve as a platform for businesses to share knowledge and as management tools on value chain information, adopting a regional focus, or take on fair labour conditions as a joint or additional objective to their organisational purposes.

Table 15.1 List of transnational fair labour arrangements

Arrangement	Abbreviation	Year of initiation
Business Social Compliance Initiative	BSCI	2003
Clean Clothes Campaign	CCC	1989 [13]
Electronic Industry Citizenship Coalition	EICC	2004
Ethical Trading Initiative	ETI	1998
Fair Labor Association	FLA	1999 [14]
Fair Wear Foundation	FWF	1999
Global Social Compliance Programme	GSCP	2006
Social Accountability International	SAI	1997 [15]
Worldwide Responsible Accredited Production	WRAP	2000
Worker Rights Consortium	WRC	2001

The institutional landscape for fair labour has thus undergone important changes in the last two decades. In the past, international conventions, national and local laws had no rivals, with mainly labour unions functioning as pressure groups to bargain for better labour rights and conditions. At present, NGOs and business initiatives have become more and more influential in setting labour standards. The voluntary nature offered by the initiatives has transformed the nature of existing regulations (O'Rourke, 2003). The fact that initiatives try to gain a competitive edge and market share (Derkx & Glasbergen, 2014) models the institutionalisation processes along the lines of market mechanisms.

15.3 Consequences in terms of responsibility, accountability, and power (re)distribution

The renewal of institutional structures is a process shaped by the interactions of the actors involved in regulatory activities. Through their organisational and normative strategic responses to the issue, and relational responses to each other, the actors induce change in the institutional characteristics of the field. The inclusion of civil society and businesses offers crucial advantages but also causes limitations. Here we take stock of the consequences of private standard setting in terms of responsibility, accountability, and power (re)distribution.

[13] While established in 1989, the CCC issued its code of labour practices in 1998.
[14] The FLA was a spinoff of the Apparel Industry Partnership (AIP) convened in 1996.
[15] SAI was created in 1997 as the Council on Economic Priorities Accreditation Agency (CEPAA) and was renamed the Social Accountability Initiative (SAI) as of 2000.

Responsibility - Private governance actors take responsibility by assuming ownership of the alleviation of labour violations by creating regulatory mechanisms that advance rights developments and detect breaches to existing laws and regulations. Even though both civil society and businesses lack parliamentary representatives and hence the claim to legitimacy through electoral representation, they do embody citizen participation through self-organisation and market mechanisms. Responsibility taken by civil society (e.g. NGOs, active citizens) is crucial in the sense that it is a critical domain that can provide impartial information on controversial issues such as human rights violations. It is particularly the role they adopt as monitoring and watchdog organisations that is valuable in terms of the dissemination of impartial information compared to the information that can be expected from government agencies or businesses (Marschall, 2002). In the last decade, large numbers of partnerships between civil society groups and businesses in the field of labour have arisen, and many companies have acceded to various fair labour arrangements that monitor business behaviour against a code of conduct, in return for membership fees.

Whereas civil responsibility is based on the social rationale, the core logic of businesses rests on economic principles (Van Huijstee, Pollock, Glasbergen, & Leroy, 2011). Responsibility taken by businesses, commonly referred to as Corporate Social Responsibility (CSR), is the self-regulation of businesses through active compliance with laws and ethical standards that is integrated into the business model. While socially responsible behaviour is crucial, the core logic of businesses does not permit responsibility to offset economic motives, so to that extent it is incongruent with its own existence.

In our study on standard setting by civil society groups operating at a transnational level for fair labour (Pekdemir, Glasbergen, & Cörvers, 2015), it was found that these private standard setting arrangements place final responsibility for solving unfair labour conduct with businesses and states, and not with themselves. The civil society groups act as intermediaries, mediating between state regulation and business conduct. The organisations placed responsibility for labour violations at business level, as it is considered to be a direct consequence of their conduct, and considered solutions founded on business motivations and principles to be more successful in addressing unfair labour. Final responsibility was in turn placed at state level as the failure of businesses to comply with law was deemed to be part of the regulatory domain through the force of (hard) law. States and international institutions such as the ILO were considered to be losing out due to the transnational organisation of value chains. While the organisations take responsibility to address unfair labour through governing activities and soft law mechanisms, they do not regard themselves as the ones bearing the greatest responsibility for the problem.

Accountability – Whereas responsibility involves taking ownership, accountability is about being liable or providing answerability for one’s actions. Multinational businesses are accountable to their stockholders and creditors, and even though there are demands that they should be more accountable to society at large, this is regularly avoided by businesses in practice (Keohane, 2008). Unlike public officials working for governments, civil society groups are, not accountable to an electorate. This limits their mandate to a claim of overall representation, but this independence does provide freedom and flexibility. They are accountable to, for instance, donors, beneficiaries, supporters, and governments within the context of providing legal and regulatory frameworks. However, these are not as direct, contractual, and time-bound as we may find with accountability of public officials and corporate managers (Marschall, 2002). As regards increasing accountability connections, it has been claimed that self-regulatory NGO initiatives are mostly engaged with upward connections with donors and governments, to the neglect of downward accountability to beneficiaries (Lloyd, 2005).

That there are deficiencies in clear accountability structures for standard setting by civil society groups on the issue of fair labour can be demonstrated by recent disasters. The fire at a Pakistani manufacturing site in 2012 and the collapse of the Rana Plaza in Bangladesh in 2013, both events with a high death toll, exemplify the case, as the fair labour organisations do not certify products and correspondingly do not fear damage to their reputation from defectively certified products. However, at both manufacturing sites, some factories were accredited by agencies that are also used by two civil society arrangements (Pekdemir, Glasbergen, & Cörvers, 2015). In the aftermath of the disasters, much attention went to strengthening compliance with international norms and rules and outcries for more involvement of governments and businesses. Civil society groups were at the front of supporting this cause, but the accountability linkages between the above-mentioned civil society groups and the disasters received almost no attention. Generally, the gap civil society groups face with regard to accountability is said to be best filled by full transparency and high standards of performance (Marschall, 2002), which in this field particularly applies to those civil society groups that claim to implement auditing and certifying practices in fair labour.

Power (re)distribution – Private sustainability governance has enabled private actors to gain substantial agency. Whereas this was once the sole jurisdiction of governments, they now have, among other powers, the ability to steer and control the governance of global value chains. Civil society groups with few or no business stakeholders often aim to compensate for perceived lack of governmental regulation, whereas self-regulation by businesses usually aims to ease or pre-empt not only actual or threatened hard governmental regulation but also the pressure of civil society groups (Abbott, 2012; Steurer, 2013). Civil society groups with sole industry representation can also be classified as functioning along the same lines as self-regulation by businesses. Even where arrangements are collaborative, business offsets the influence of “green” participants, which in turn limits benefits to sustainability (Newig & Fritsch, 2009).

The nature and consequences of this shift to private authority, particularly regarding the role of businesses, causes many scholars to underscore potential “win-win” outcomes, but causes other scholars to be deeply concerned (Abbott, 2012). Some regard it as a manifestation of the longstanding powers of businesses, albeit in new forms (e.g. Buthe, 2010), whereas other scholars see it as integral to a broad ideological shift towards the market, developed and legitimised by elites across all domains (e.g. Levy & Newell, 2002).

That regulatory power has been redistributed from public to private authority will here be exemplified by two cases in point. First, an analysis of the different codes of conduct by the civil society groups makes it clear that there is not only diversity among the standards, but the codes of the least stringent standards even water down ILO core rights by either omission or ambiguous phrasing of core provisions (Pekdemir, Glasbergen, & Cörvers, 2015). As such, these provisions challenge the authority of ILO conventions as an authoritative model code.

Secondly, even though most of these civil society groups are collaborative, the industry is overall more firmly represented across the governance boards of the fair labour governance arrangements. Out of the 10 arrangements, 2 are intra-sectoral and only have civil society representatives, including NGOs, universities and colleges, and individuals with no formal ties to the industry. The other 8 arrangements have industry representatives in their governance boards. Out of these 8 arrangements, 2 are intra-sectoral and only have industry representatives, and 6 are intersectoral and also have civil society representatives. Out of these 6 intersectoral arrangements, only 2 have union representatives in their governance boards. Hence, direct representation of workers by unions in the governance boards is marginal. Hence, workers’ rights are currently more proposed by industry stakeholders and the corporate world than by unions.

15.4 Conclusion

Institutional change in the field of fair labour embodies a shift from public to private responsibility for the development and enforcement of labour laws and regulations. The regulatory reconfiguration from governments to global governance implies a new division of powers between governments, businesses, and civil society. However, the complementary shift from private responsibility to private accountability has yet to occur. The presumed checks and balances between governments, businesses, and civil society might turn out to be mere contests for power as regards ways to realise the changes necessary for the protection and improvement (Pekdemir, Glasbergen, & Cörvers, 2015) of labour rights and working conditions. Whether the introduction of private standard setting arrangements is enough to minimise the regulatory gap left by the ILO and other governmental and intergovernmental institutions remains to be seen, but normative concerns are gaining prominence in light of continued labour violations.

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Chapter 16

Global certification of agricultural products in Indonesia: curse or blessing?

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Abstract

Consumers in developed countries are increasingly being seduced to buy so-called sustainable, certified products. The higher purchase price of many of these products is justified by referring to numerous advantages for farmers in developing countries. Current research into the impacts of certification is however fragmented, and conclusions often appear contradictory. Therefore, the “Global Certifying Partnerships” project analyses the effects of certification of agricultural products on Indonesian farmers. It also analyses the responses of Southern governments and NGOs to certification schemes which are mostly developed by Northern-based business-NGO collaborations. This chapter reports some preliminary insights and concludes that certification may lead to direct, but also indirect benefits for Indonesian smallholders. To better understand the (potential) impact of certification on Indonesian farmers, it is however crucial to obtain a better understanding of the social, political, and economic structures in which certification is embedded and through which certification may affect Indonesian smallholder’s livelihoods.

16.1 Introduction

Products certified as sustainable are generally more expensive than conventional products. The higher purchase price of many of these certified products is justified by referring to numerous advantages for farmers in developing countries. By paying a bit more for a certified product, the consumer is believed to contribute to better living conditions, a cleaner environment and a richer nature in developing countries in Asia, Latin America, and Africa. Most research into the effects of certification on farmers has been conducted in Latin America and Africa (e.g. Arnould et al., 2009; Bacon et al., 2008; Bacon, 2005; Bechetti and Costantino, 2008; Bitzer, Glasbergen, & Arts, 2013; Raynolds et al., 2004; Ruben and Zuniga, 2011; Ruben and Fort, 2012; Valkila, 2009), and little is known about the effects of certification on farmers in Asia, and Indonesia in particular. Indonesia is, however, an important exporting country for agricultural products like coffee, palm oil, cocoa, and rubber.

16.2 The rise and rationale of certification

Since food and food products being consumed in Northern (developed) countries are often produced in Southern (developing) countries, consumer behaviour in the North affects agricultural practices in the South. This does not only relate to the quality standard of a product, but also to the way in which it is produced. In recent decades, awareness has increased that Southern countries alone cannot take the full responsibility for meeting Northern requirements and for combating the negative consequences of the global production and consumption of agricultural products. These negative consequences relate in the first place to poor living conditions for the farmers and their families in developing countries, with farmers struggling to survive economically, and to the devastating effects on the environment (for example due to excessive use of pesticides and fertilisers). Sustainability certification schemes, which were introduced into the market and significantly increased in numbers from the 1990s onwards (Ecolabel index, 2015) can be seen as a response to these issues. These certificates are often developed and monitored by so-called Partnerships in the North to regulate the agricultural production globally, and particularly in the South. To become certified, farmers have to comply with standards and requirements of good agricultural practices. These include reforestation of river banks, banning child labour, reduced use of pesticides and fertilisers, using protective clothing and shoes, and using artificial retention basins for waste-water. Farmers with a certificate generally receive training, a premium fee, or both, depending on the scheme (and sometimes the exporter) they cooperate with.

Well-known private certification schemes include UTZ (e.g. cocoa, coffee, tea), Fair Trade (e.g. coffee, tea, nuts, rice, spices), Organic (e.g. cocoa, tea, clothing), RSPO (palm oil), 4C (coffee), MSC (fish) and FSC (wood). Companies such as Unilever and Mars can buy certified products as a way of showing environmental and social responsibility, as set out in their Corporate Social Responsibility (CSR) strategies. Other businesses, as well as Northern NGOs, actively promote the demand for certified agricultural products (Arifin, 2010; Pesqueira and Glasbergen, 2012), and more and more consumers choose to buy certified products, although this is still a niche market. In 2009, only 8% of all globally exported green coffee beans had some form of certification. The Netherlands is among the leading countries in terms of the market share of certified coffee, which amounted to around 40% in 2009 (compared to 16% in the United States and 5% in Germany) (ITC, 2011).

Many empirical studies have been conducted to analyse the impact of certification. Results, however, often seem contradictory and fluctuate between attributing positive effects to certification (see for example Becchetti and Costantino, 2008; Consumers International, 2005; Raynolds, Murray, and Taylor, 2004; Rueda and Lambin, 2013) through attributing insignificant benefits (Bacon 2005; Bacon et al., 2008; Bitzer, Francken and Glasbergen, 2008; Valkila 2009), and even attributing negative consequences for livelihoods to certification (for example Beuchelt and Zeller, 2011; Utting-Chamorro, 2005). Negative consequences often relate to increasing dependency of farmers and to costs, whereas positive effects mostly refer to higher income for farmers, better livelihood conditions, and/or better environmental conditions.

16.3 Farmers' preferences for certification

Certification as designed by actors from the North may ignore difficulties faced by farmers in the South. Farmers often have to change their traditional farming methods and abandon local values. At farm level, Wahyudi and Jati (2012) observe that many farmers hardly understand the meaning, mechanism, and purpose of certification programmes. They are not fully aware of the benefits and the rationale of certification for sustainable agriculture. Because of this, many farmers feel that certification is favouring Northern businesses and consumers, and is a tool to discriminate against their products. So what does the most preferred certification scheme look like to Indonesian farmers themselves? One of the authors, Ibnu, has analysed farmers' preferences for various characteristics of existing certification programmes. He examined the preferences of coffee farmers participating in three global certification schemes (4C, Rainforest Alliance, and UTZ certification), and one locally issued standard (Inofice Organic) in the Indonesian province of Lampung.

Ibnu (2015) found that farmers are rather comparable in terms of their preferences, regardless of the certification scheme they are part of. The presence of a price premium is the most preferred attribute, followed by environmental conservation, a price differential against uncertified coffee, farmer groups or cooperatives as targets, emphasis on fairness, price differentials based on coffee bean sizes, no contract, and no pre-finance but cash payment at the transaction stage (see Table 16.1). For more information about the methods used, see Ibnu et. al (2015).

Table 16.1 Characteristics of the most preferred certification scheme according to coffee farmers in the Indonesian province of Lampung

Preference 1 *	Price premium
Preference 2	Focus on nature conservation (defined by the farmers as conservation of cultural heritage)
Preference 3	Price difference (higher price) compared to non-certified farmers
Preference 4	Focus on farmers in a group or cooperative (instead of individuals or companies/estates)
Preference 5	More emphasis on fairness as a goal
Preference 6	Price differential based on coffee bean sizes (higher price for larger beans)
Preference 7	Absence of contracts with buyers
Preference 8	Absence of formal credits

* The order of the preferences indicates the importance attached to each characteristic by the farmers. Preference 1 was considered the most important characteristic, followed by the second, third etcetera.

Price differentials based on the coffee bean sizes (preference 6) are currently not yet part of any certification scheme. Regarding the environmental focus, farmers who subscribe to the local Inofice standard attached higher preference to organic than to conservation, but farmers from the other schemes preferred conservation. Ibnu also showed that, according to the farmers, nature conservation in this context explicitly focusses on the conservation of cultural heritage, and to a lesser extent on nature conservation. Fairness was considered important as most farmers did not fully understand the price-setting mechanisms; they had the feeling they might be receiving unfair prices, which ought to be higher. The preference for not having a contract or credit results from the farmer's lack of understanding of formal procedures and the strong social ties with family and friends. Farmers prefer to be free to sell coffee to anyone offering higher prices; they sometimes even keep coffee at home to see whether prices will increase, or they prefer to sell to anyone with whom they wish to uphold social relations. They are afraid that formal contracts may prohibit them from doing so. Also, not understanding formal procedures concerning credit and possibilities to borrow money from family and friends lead to a preference for not having a formal credit option through their certification scheme.

16.4 Influence of certification schemes on economic performance

Although not all aspects of existing certification schemes are valued by the farmers, we can still examine whether farmers benefit financially from certification. Sri Astuti (2015) found that certified farmers do indeed receive higher prices for their coffee compared to conventional farmers. This difference is rather small, however (€ 0.03 - € 0.16 per kilogram), depending on the coffee brand (Robusta or Arabica), and results from the better quality of the certified coffee beans rather than the certificate as such. This higher quality is manifested in lower moisture content, less physical defects, and larger-sized beans, compared to conventional coffee. The margins for farmers, traders, and exporters are higher for Arabica coffee than for Robusta coffee. This can be explained by the preferences of the domestic, Indonesian consumers. Indonesians consider Arabica coffee from Gayo in Aceh an exceptionally good brand with a very good taste, and are hence willing to pay higher prices for these beans. The absolute gross margin in the table below refers to the average extra price paid for certified coffee compared to conventional coffee. If we sum up these margins for all actors, we see that farmers only receive 1.36% (in the case of Robusta coffee) and 5.6% (for Arabica coffee) of the total additional price paid for certified coffee compared to conventional coffee. Sri Astuti concluded that it is not the Indonesian coffee farmer who benefits most from the higher price paid by the consumers, but the roasters, who take the largest absolute gross margin in the value chain (see Table 16.2). This may not be too surprising from an economic point of view (as the roasters transform a raw product into a consumer product), but it is surprising from a sustainability point of view.

Table 16.2 Actors pay more for certified coffee than for conventional coffee; this extra margin is called "economic rent". If we look at the total amount of economic rent earned through the entire coffee production chain, we see that the famers' economic rent is low in both absolute and relative terms. The roasters benefit most

	Actor	Absolute gross margin per kilo in Rupiah/ Euro. (Average price per kg of certified coffee minus the average price per kg of conventional coffee)	Relative gross margin (Relative share of each actor in the total gross margins of certified coffee compared to conventional coffee)
Robusta	Farmer	400 / 0,03	1.36%
	Trader	231 / 0,01	1,47%
	Exporter	500 / 0,03	1,70%
	Roaster	81800 / 5,29	95,46%
Arabica	Farmer	2200 / 0,16	5,6%
	Trader	2100 / 0,15	5,4%
	Exporter	2050 / 0,13	5,3%
	Roaster	32500 / 2,10	83,7%

16.5 Potential effects of sustainable palm oil certification on smallholders' livelihoods

If the financial benefits of certification can be said to be quite small, can we then define other benefits, for example positive effects on the farmers' livelihoods? Existing studies show conflicting results, which can partially be explained by the different and often random selection of variables. Kurniawati Hidayat therefore suggested an amended sustainable livelihood framework to better conceptualise the relation between certification and smallholders' livelihoods.

Kurniawati Hidayat's study (2015) indicates that the Roundtable on Sustainable Palm Oil (RSPO) – which sets standards for and certifies sustainable palm oil – has the potential to improve the livelihoods of certified smallholders in a direct and indirect way. Certification directly increases a smallholder's opportunities for strengthening their organisation, training, and use of safety equipment (see Table 16.3).

Table 16.3 Benefits of certification for smallholders' livelihoods

Assets	Direct	Indirect
Social capital		
Strengthening organisation	√	
Increasing smallholders' trust in organisation		√
Increasing participation in organisations		√
Increasing connections and networking		√
Human capital		
Increasing opportunity for training (improving knowledge and skills)	√	
Better health		√
Physical capital		
Providing safety equipment and building chemical storage system, sanitary rooms, waste ponds, and owl's nests and planting *Turnera* (white alder flower)	√	
Natural capital		
Conserving soil and water quality		√
Protecting biodiversity		√
Financial capital		
Increasing income		√
Increasing credit access		√
Premium fee		√

Thanks to improvements to their production methods, the smallholders may thus indirectly profit from participation in the certification scheme. This means that they are able to improve the volume and quality of their production. Participation in the certification scheme does not, however, significantly improve the farmers' access to the global market, nor the farmers' vulnerability to price volatility. This can generally be explained by the fact that certified farmers remain dependent on companies (mills), as the buyers of their products, who also set the prices.

16.6 The role of Indonesian NGOs in certification

Instinctively we might expect that NGOs may play a role in strengthening farmers' bargaining position towards companies, or reducing their vulnerability to price fluctuations in the context of certification. Kosasih studied 26 Southern NGOs working all over Indonesia to find out their opinions and roles regarding certification. She identified four different roles adopted by Indonesian NGOs and found that these roles can be explained by two dimensions: an NGO's orientation and their attitude towards change (see Figure 16.1).

OUTWARD	Intermediary Organisation (8)	Certification Facilitator (6)
INWARD	Guardian of Local Values (3)	Solution Provider (9)
	CONSERVATIVE	PROGRESSIVE

Figure 16.1 Roles of Southern NGOs and the number of interviewed NGOs that could be identified as fulfilling each role (total N=26)

An NGO's orientation refers to their definition of who is responsible for solving problems resulting from certification. This orientation can be inward (e.g. they see themselves as being responsible for it), or outward (e.g. they regard other actors as being responsible and expect them to take action). The response towards change may be conservative in the sense that NGOs are reluctant to embrace new realities. This often results in framing certification as a threat and in a desire to adapt certification schemes to local values. Progressive NGOs are more receptive to change and are willing to learn about certification and to approach new realities as an opportunity rather than a threat. These two axes result in four roles:

1) Intermediary NGOs using certification to link the global context with the local context (for example by mediating between international NGOs, local/national NGOs, and businesses).
2) NGOs facilitating certification and working together with companies assisting farmers to be compliant with certification standards. They generally approach certification as something that can no longer be denied or stopped.
3) Safeguarding traditional values, which translates as emphasising the "indigenousness" of agricultural practices. These NGOs often associate certification with a Western concept that is judged to be in disharmony with local traditions; they explicitly reject certification.

4) Solution providers acknowledge that certification is difficult for smallholders. They offer alternatives if certification does not fit the farmers' situation.

Although NGO roles have proven to be dynamic, and thus changeable over time, the role of solution provider was most often identified, closely followed by the role as intermediary organisations. For smallholders, this implies assistance to meet requirements, or the provision of alternatives if certification turns out to be unfavourable for the smallholders. For example, the Participatory Guarantee System (PGS) requires trust among all members, as it aims to implement sustainable practices without formal evaluation procedures.

16.7 Response of the Indonesian government to private certification

As we have seen, NGOs respond to certification in different ways. What then about governments? How do they respond to, and perceive, the phenomenon of private certification schemes that try to regulate the production of agricultural products in their country? Do they also provide alternatives to private certification? The literature indicates that the presence of private certification can be both positive and negative for Southern governments. Positive, as it offers opportunities to improve their image (Martinez and Poole, 2004; TSPN, 2011) and expresses a sense of good governance, conveying transparency, accountability, and efficiency. Governments may also gain (or be assisted in gaining) technology transformation, transfer of knowledge and skills, more efficient management systems, and an upgrade of agricultural market conditions (Douma & van Wijk, 2012; Martinez & Poole, 2004). Negative aspects often refer to sharing authority in the agricultural management system and losing their sovereignty (or part of it).

Wijaya investigated the Indonesian government's response to the private certification of palm oil through the Roundtable on Sustainable Palm Oil (RSPO). In an early phase, and influenced by trade liberalisation and decentralisation, the Indonesian national government took a non-responsive position towards the RSPO. Later, the government realised that the RSPO was becoming more and more successful as a sustainability scheme; they accepted the RSPO as a new management model and became involved, adopting the role of an expert on the Indonesian context. In this new role they learnt a lot about private certification, and confidence grew that the government itself would be able to develop its own system of sustainability standards. In this phase, the government developed their own public certification scheme for palm oil, the Indonesian Sustainable Palm Oil (ISPO) in 2009. Wijaya examined the reasons underlying this decision and identified three important aspects. First, the government increasingly approached the regulation of palm oil production as a national issue that should become part of their governmental responsibility. Second, from a feeling of national pride, the government wanted to express its dissent towards the RSPO and the perceived unbalanced power relation between consumer countries in the North and producer countries such as Indonesia in the South. And third, the government started to view the RSPO as a trade barrier for their palm oil exports. Important parts of the market for palm oil were supposed to be best approached with an Indonesian and legally based certification scheme, the ISPO. The recent experiences with the ISPO inspired the Indonesian government to also develop national sustainability standards for coffee and cocoa. This indicates that a new policy approach in agricultural sustainability certification has emerged in which a Southern country gradually takes a leading role and affirms its national identity as a producing country.

16.8 Conclusion

Whether global certification is a curse or blessing for Indonesia cannot be answered in this single chapter. The practice and even the concept of certification are still being debated, and the profitability of certification for Indonesian farmers is only glimpsed. It is important to gain a better understanding of the role of certification in enhancing sustainability, and in particular improving the livelihoods of farmers and their families in the South who are involved in global agricultural product chains. It also seems important to closely monitor currently emerging alternatives to private certification schemes, initiated by NGOs or governments, to learn more about mechanisms to improve sustainable production processes.

This chapter has shown some aspects of global certification. The various actors involved in it, the opportunities and challenges it brings, and the mediating factors that may play an important role in explaining the relation between certification and improvements to livelihoods, are crucial to understand how good or bad certification is. Certification targets a very complex system that does not only refer to agricultural practices in the South, but also to global trade relations that link Northern consumption and its externalities to Southern production and impacts. This complexity asks for a holistic analysis of, and a more integrated approach to, global certification. Amongst other things, this requires better insight into relations between Northern and Southern actors, but also among actors in the South. It is important to understand motivations for Southern actors to join certification (or not), and to understand obstacles undermining the potential of certification to improve the livelihoods of farmers and their families. Lastly, the complexity of certification is manifested in the existence of formal and informal political, economic, and social structures inherent (and sometimes very specific) to Indonesian society. A thorough understanding of these structures is therefore required as well. In the next phase of our research we are trying try to shed more light on these complexities.

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Chapter 17

Sustainable Forest Management as a potential integrative approach in international public policy

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Abstract

Deforestation negatively affects the provision of environmental services, and consequently affects local populations' livelihoods that depend on the use of forest resources. Sustainable Forest Management (SFM) aims to use forest resources in such a way as to provide environmental services while at the same time achieving economic and social goals. Even though there is currently no forest convention in an international public policy context, the SFM concept is included in several international public policy forums. The present chapter analyses SFM in three United Nations Conventions (CBD – on Biological Diversity, UNFCCC – on Climate Change, and UNCCD – to Combat Desertification). The chapter concludes that SFM is a broad concept, and its implementation specificities are addressed at a national policy scale, which is mainly influenced by the sovereignty principle. Finally, we concluded that the SFM concept still hardly touches upon the social dimension, compared to the economic and environmental dimensions.

List of abbreviations

CBD – United Nations Convention on Biological Diversity
DLDD – Desertification, Land Degradation and Drought
ECOSOC – Economic and Social Council
FAO – United Nations Food and Agricultural Organisation
SFM – Sustainable Forest Management
IFF – Intergovernmental Forum on Forests
IPF – Intergovernmental Panel on Forests
UN – United Nations
UNCCD – United Nations Convention to Combat Desertification
UNCED – United Nations Conference on Environment and Development
UNFCCC – United Nations Framework Convention on Climate Change
UNFF – United Nations Forum on Forests

17.1 Introduction

Deforestation has negative consequences for the provision of environmental services such as water, fertile soil, biodiversity, and climate regulation (FAO, 2010, p. 112), and affects local populations whose livelihoods depend heavily on the use of forest resources (like wood, oils, fruits, and fibres) (Paupitz, 2010, p. 59). Together with land degradation and climate change, deforestation is among the main causes of increased vulnerability to desertification. In arid and semi-arid regions, deforestation also increases the risk of droughts and biodiversity loss (FAO, 2010, p.112; Dudley, MacKinnon & Stolton, 2014, p. 178), contributing to poverty and migration of local populations (UN, 2014, p. 9).

The relation between deforestation, climate change, biodiversity loss, and desertification is discussed in several international public policy forums, which aim to develop common approaches in order to use environmental resources more sustainably. In this context, Sustainable Forest Management (SFM) is an internationally discussed concept that may have the potential to contribute to the sustainable use of forest resources. Although various definitions have been given, SFM generally aims to balance environmental, social, and economic benefits related to forest resources and their use (Arts & Buizer, 2009, p.345; Hickey, 2008, p. 109). What we observe in the current literature, however, is the need for a more precise understanding of the meaning of SFM, and more specifically, how it can be applied in an integrated manner in different forests or socio-economic circumstances (Haberl *et al.*, 2013, p.1; Quine, Bailey & Watts, 2013, p. 867; Hahn & Knoke, 2010, p. 797; Hickey, 2008, p. 109; Sayer & Maginnis, 2005, p. 15).

This chapter discusses how the concept of SFM has been developed at the international level, and whether it can be considered an integrated strategy to simultaneously tackle economic, social, and environmental challenges related to the use of forest resources, climate change, biodiversity loss, and desertification. The research results from the project entitled "Sustainable forest management to avoid deforestation and desertification vulnerability through an integrated strategy in the Caatinga biome, Brazil" funded by CAPES/Brazil.

17.2 SFM from an international environmental policy perspective

Particularly since the United Nations Conference on Environment and Development (UNCED) in 1992, sustainable development has become central to international governance strategies and discussions (Drexhage & Murphy, 2010, p.9; Hahn & Knoke, 2010, pp. 787-788). Within this context, SFM has emerged as one of the strategies which may contribute to sustainable development. By balancing economic, social, and environmental values of all types of forests, Sustainable Forest Management aims to benefit present and future generations by contributing to poverty eradication, providing livelihood resources and employment to local populations, and ensuring essential environmental services (FAO, 2015).

Although SFM initially focused on timber trade, it gradually also came to cover forest resources and services like fruits, fibres, wood for energy, biodiversity, and soil and water quality (Hahn & Knoke, 2010, p.790; Sayer & Maginnis, 2005, pp. 13-14). it is through this extended scope that the relation between sustainable forest management and livelihoods became part of the concept. Currently, criteria and indicators (C&Is) for the evaluation of SFM cover seven thematic areas: (i) extent of forest resources; (ii) forest health and vitality; (iii) productive functions of forests; (iv) biological diversity; (v) rotational functions of forests; (vi) socio-economic benefits and needs; and (vii) legal, policy, and institutional framework[16]. Although a general interpretation of these criteria exists, it is very hard to find a clear operationalisation (Rist & Moen, 2013, pp. 416-417). An equally broad approach can be found in the internationally defined non-legally binding instrument known as "Forest Principles"[17], adopted in 1992 during the United Nations Conference on Environment and Development (UNCED). Preamble (c) of these Forest Principles attests that forestry should balance environmental and developmental goals, acknowledging the economic and social stress that can be caused by constrained or restricted use of forests[18]. The document also emphasises in Principle 2(b) that "Forest resources and forest lands should be sustainably managed to meet social, economic, ecological, cultural and spiritual needs of present and future generations"[19]. This broad diversity of needs that are supposed to be met through SFM illustrates that an integrated approach – balancing all these needs – must be a challenging ambition. The concept's broad scope, and the different ways in which social, economic, and environmental needs can be interpreted and defined, are not the only challenging aspects of the concept and its implementation.

The "Forest Principles" mention that "States have the sovereign and inalienable right to utilize, manage, and develop their forests in accordance with their development needs and level of socio-economic development" (Principle 2(a)) and have the "sovereign right to exploit their own resources pursuant to their own environmental policies" (Principle 1(a)) (UN, 1992a). The principle of sovereignty means that states have jurisdiction over their territory, including their natural resources, which is a core principle in international law (Sands & Peel, 2012, pp. 11-12). In view of this, states may feel reluctant to sign up to international binding commitments which may limit their national discretion, including how to manage their natural resources. This limits the possibility to define and enforce an internationally agreed commitment to manage forests sustainably.

[16] See Resolution 4/3 in the 'Report on of the Fourth Session of the United Nations Forum on Forests', reference UN, 2004, p. 7.

[17] It is officially called the '*Non-legally binding authoritative statement of principles for a global consensus on the management, conservation and sustainable development of all types of forests*', see the Report of the United Nations Conference on Environment and Development – Annex III, reference UN, 1992a.

[18] See reference above.

[19] See reference above.

Alternatively, international environmental treaties on forests issues may set general aims or principles that establish the preconditions under which sovereign nation states can develop their own forest-related policies. These treaties often require national policy development as a part of the adoption of substantive, binding commitments at the international level. This strategy for national policy planning is prescribed, for example, in the United Nations Convention on Biological Diversity (CBD) (Article 6a)[20]; the United Nations Framework Convention on Climate Change (UNFCCC) (Article 4(1b))[21]; and the Convention to Combat Desertification (UNCCD) (Article 10)[22]. Following this strategy, states might maintain their national sovereignty regarding the way in which they define and regulate the use of environmental resources related to biodiversity, climate change, and desertification (Eikermann, 2015, p. 106, p. 183).

Nevertheless, this may imply that national policies developed under the guidance of such treaties differ greatly in their ambition and content regarding the concept of SFM, depending on each state's individual circumstances and interpretations. The issue of national sovereignty and the resulting diversity of approaches to forest use may contribute to a fragmented picture of what exactly is meant and implied by SFM in the international and national contexts. The fragmented character of SFM in international conventions can be further exemplified by the fact that, so far, international negotiations among states have failed to produce a forest convention. Nevertheless, existing international conventions may, although not specifically targeting forests, have an impact on forests (Eikermann, 2015, p.184). This is true for the United Nations Convention on Biological Diversity, the United Nations Framework on Climate Change and the United Nations Convention to Combat Desertification (see section 3).

According to the literature, the development of a forest convention is particularly hampered by: (1) the principle of sovereignty, as states insist on their right to exploit their own forest resources under their own national legislation (Eikermann, 2015, p. 183; Kunzmann, 2008, p. 986); (2) the absence of agreements on principles and definitions needed for a forest convention, like disagreement on the specific meaning of SFM and the various ways in which it can be applied in different contexts, the division of responsibilities for funding, and the formulation of time-bounded objectives for its implementation (Eikermann, 2015, p.186; Kunzmann, 2008, p. 985; Schneider, 2006, p. 7); and finally, (3) the current fragmentation of international environmental law, which makes synergies between existing treaties a prerequisite for creating a new international binding agreement on forests (Eikermann, 2015, p.184; Ruis, 2001, p.2).

Notwithstanding the difficulties encountered in defining a forest convention, there has been an attempt to establish a unified legal framework for forests: the United Nations Forum on Forests (UNFF). The UNFF was established in 2000 with the aim of developing a common international understanding about forest management, in order

[20] See United Nations Convention on Biological Diversity, reference UN, 1992b.
[21] See United Nations Framework on Climate Change, reference UN, 1992c.
[22] See United Nations Convention to Combat Desertification, reference UN, 1994.

to develop a "legally binding instrument on forests"[23]. Although its members initially failed to agree on such an instrument, the "Non-legally Binding Instrument on Sustainable Forest Management for all Types of Forests" was eventually adopted in 2007[24]. Even though this is a non-legally binding instrument, it can be considered the most authoritative document so far, and defines SFM as:

> "(…) a dynamic and evolving concept, [aiming] to maintain and enhance the economic, social and environmental values of all types of forests, for the benefit of present and future generations" *[Chapter III, paragraph 4] (UN, 2007a).*

Still, this definition, in particular the vague definition of "all types of forests" as "forests and trees outside forests" (First Preamble Paragraph)[25] may simply imply enhancing the economic, social, and environmental value of all trees in the world. It neither specifies nor prioritises types of forests, services, or resources provided by these forests. This vagueness may raise the expectation of a more specific definition at nation-state level. However, as mentioned above, national sovereignty in using natural resources may result in very different definitions and goals for SFM in national policies. Although becoming more specific at national level, the concept may become even more diverse at international level.

17.3 International treaties with a focus, and possible impact, on SFM

The United Nations Convention on Biological Diversity (CBD) (adopted in 1992) does not focus solely on forests, but may have an impact on forest management or forest policies. The CBD Conference of the Parties Decision V/6, A.1 defines an Ecosystem Approach, which embodies a fundamental concept within the CBD, as "a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way"[26]. In the context of the Ecosystem Approach, SFM can be understood as a tool to promote forest conservation. In its Conference of the Parties IX/5, CBD recognises the promotion of SFM and the Ecosystem Approach as the best

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[23] An "open-ended ad hoc Intergovernmental Panel on Forests" (IPF) was established in 1995, and an "ad hoc open-ended Intergovernmental Forum on Forests" (IFF) in 1997. The United Nations Forum on Forests (UNFF) was established in the year 2000 as a subsidiary body of the Economic and Social Council (ECOSOC), through its Resolution 2000/35; it is composed of all United Nations Member States, to promote and facilitate dialogue and policy development, evolving governments, international institutions and major groups, for "*the management, conservation and sustainable development of the world's forests, and to strengthen long-term political commitment to this end*". See Resolutions and Decisions of the Economic and Social Council, in reference UN, 2001.

[24] See the Non-legally binding instrument on sustainable forest management for all types of forests, reference UN, 2007a.

[25] See reference above.

[26] See Report of the Fifth Meeting of the Conference of the Parties to the Conventional on Biological Diversity, reference UN, 2000.

strategies to maintain forest biodiversity (Paragraph 1, Item k)[27], simultaneously alleviating the poverty of local populations who depend on forest resources, and recognising the importance of non-wood products for their livelihoods (Paragraph 2, Item d)[28].

Under the 1992 Framework Convention on Climate Change and its 1997 Kyoto Protocol, SFM is used in the context of greenhouse gas emissions reduction. In the Kyoto Protocol, for instance, SFM is mentioned together with afforestation and reforestation as strategies to maintain, recover, or “develop” forest carbon reservoirs (Article 2, Paragraph 1a(ii))[29]. The Clean Development Mechanism (CDM) allows Kyoto Protocol parties with reduction commitments to implement afforestation and reforestation activities as part of their efforts to reduce emissions (Eikermann, 2015, p.108; Article 12, Paragraph 3 (a) and (b))[30]. Although SFM is explicitly mentioned as one of the possible strategies to develop or maintain carbon sinks, the CDM does not include SFM initiatives. A major reason for this is that it is difficult to quantify the exact contribution of SFM initiatives to reducing the emissions of greenhouse gases (Eikermann, 2015, p. 114).

In addition to this, and also under the UNFCCC flag, the “Reducing Emissions from Deforestation and Forest Degradation” (REDD+) programme has been established through its Conference of the Parties Decision 2/CP.13[31]. The REDD+ Program – which has not yet been codified into a legally binding agreement – includes SFM as a possible strategy to reduce greenhouse gas emissions, more specifically carbon dioxide (Paragraph 70, The Cancun Agreements)[32]. The REDD+ programme is based on a system of payments to local initiatives to avoid deforestation; it provides monetary incentives to maintain forests instead of using them for other, more environmentally harmful activities. The REDD+ programme is rather controversial because of the lack of methodologies to quantify its contribution to greenhouse gas reduction, and because of its focus on the economic value of forest resources, which may contribute to a neglect of the ecological and social functions of forests in debates (Wiersema, 2014, p. 2).

Finally, the United Nations Convention to Combat Desertification (UNCCD), concluded in 1994, includes deforestation and loss of biodiversity in the definition of “land degradation” in its Article 1, Item (f)[33]. This treaty seems of particular interest for arid and semiarid ecosystems, touching upon the importance of forests in these ecosystems, like the Caatinga biome in Brazil discussed in Box 17.1 below.

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[27] See Decisions Adopted by the Conference of the Parties to the Convention on Biological Diversity at its Ninth Meeting, reference UN, 2008.
[28] See reference above.
[29] See Kyoto Protocol to the United Nations Framework Convention on Climate Change, reference UN, 1998.
[30] See reference above.
[31] See Report of the Conference of the Parties at its Thirteenth Session – Addendum – Part two: Action taken by the Conference of the Parties at its eighth session, reference UN, 2007b.
[32] See Report of the Conference of the Parties on its sixteenth session, held in Cancun, reference UN, 2011.
[33] See Elaboration of an International Convention to Combat Desertification in countries experiencing serious drought and/or desertification, particularly in Africa, reference UN, 1994.

Box 17.1 - Caatinga biome, a dry forest which Sustainable Forest Management can connect climate change, biodiversity, and desertification issues

The Caatinga biome is one of the six biomes officially recognised by the Brazilian government (Brasil, 2004a, p. 1) and classified as "Tropical Dry Forests" in the international literature. Similar forests can be found in Africa (Miombo, Sudanese woodlands, and savannah biomes); in South America (Cerrado and Chaco biomes); and Asia (Dipterocarp forest and woodland biomes) (FAO, 2001, p. 18; USDA-NRCS, 2000, p. 1). Caatinga biome is located in the north-east of Brazil in a semiarid region, which has an average annual rainfall of less than 800 mm and an "aridity index" between 0.21 and 0.5, resulting in a drought risk exceeding 60% (Brasil, 2004b, p. 3). Caatinga biome covers 844,000 km^2 distributed over 10 federal states; primary forests cover around 49% of its area, while degraded land and urban areas cover around 50%, and 1% is covered by water (lakes and rivers) (Brasil, 2013, p. 56; Brasil, 2011a, p. 18) Caatinga biome is also known as the most biodiverse as well as densely populated semiarid regions in the world, with a population of more than 27 million people (Brasil, 2011b, p. 7).

Deforestation plays a major role in Caatinga and is related to human activities, like livestock farming, agriculture, and the use of wood for energy (charcoal and firewood) (Sampaio, 2010, p. 35, p. 42; Riegelhaupt & Pareyn, 2010, p. 71; Bakke et al., 2010, p. 160; Queiroz, 2011, p. 1142). Deforestation, land degradation, and climate change have been identified as the main causes of increasing desertification vulnerability, risks of drought and biodiversity loss in semiarid regions around the world (FAO, 2010, p. 112; Dudley, MacKinnon & Stolton, 2014, p. 178), including Caatinga biome (Brasil, 2007, p. 18; Brasil, 2011c, p. 119; Martins & Barreto de Melo, 2012, p. 93). Desertification can contribute directly to poverty and migration of local populations as they lose their livelihood, which was based on environmental resource use (UN, 2014, p. 9; Martins & Barreto de Melo, 2012, p. 93).

Caatinga biome has the potential to aggregate policies related to forest issues, climate change, biodiversity, and desertification. In this context, Caatinga is an interesting case study where Sustainable Forest Management can be analysed in such a way as to integrate actions to achieve environmental, economic, and social goals, and at the same time improve the livelihoods of local populations and combating poverty and migration (Paupitz, 2010, p. 59, Riegelhaupt, Pareyn & Gariglio, 2010, p. 364).

The UNCCD "Strategy" (Decision 3 of the Eight Session of its Conference of the Parties)[34], defines SFM as a component of a sustainable land management strategy to

[34] See 'Report of the Eight Session of the United Nations Convention to Combat Desertification', reference, UN, 2007c.

combat Desertification, Land Degradation and Drought (DLDD), which contributes to the conservation and sustainable use of biodiversity. Under the UNCCD, SFM can be interpreted as a proactive and preventive action to build or increase the resilience capacity of ecosystems, either in response to drought events or to desertification vulnerability (Wilhite, Sivakumar & Pulwarty, 2014, p. 4; Sivakumar et al., 2014, p. 131).

A preliminary evaluation shows that the way in which the United Nations CBD defines SFM has the theoretical potential to integrate environmental (e.g. biodiversity conservation), social (interpreted as social development and the acknowledgement of tacit knowledge), and economic values (related to sustaining livelihoods). The UNFCCC, and more specifically the REDD+ programme, moves the SFM concept into a more economic perspective, as the REDD+ programme is based on economic valuations of forest resources such as carbon sinks. In this sense, the UNFCCC approach to SFM mostly relates to economic and environmental values of forests, and seems to place less emphasis on social considerations. Finally, the UNCCD emphasises the environmental value of forests and their contribution to building resilient ecosystems and maintaining environmental services on which local populations' livelihoods depend. The UNCCD can therefore be considered to touch upon social, economic, and environmental values.

Even in the absence of specific international forest treaties, the above-mentioned international treaties may influence national forest policies of participating states. At the same time, there may however be inconsistencies between these international legal instruments (Eikermann, 2015, p. 184; Van Asselt, 2014, p. 253, Van Asselt, 2011, p. 1211). One inconsistency can be found between the role of forests in the United Nations Convention on Biodiversity (CBD) and in the United Nations Framework Convention on Climate Change (UNFCCC): the incentive from the UNFCCC to use forests as carbon sinks may have a positive effect on greenhouse gas reduction, but a negative impact on biodiversity objectives. The use of forests as carbon sinks may imply forest monoculture, focusing on the most effective species to absorb greenhouse gases, which however has a negative influence on biodiversity (Van Asselt, 2014, p. 130; Van Asselt, 2011, p. 1232; Raunikar et al., 2010, p. 56).

17.4 Conclusion

Current international environmental law has a fragmented character. This is certainly also the case for the protection of forests, since there is no single forest convention. SFM, which is assumed to address environmental, economic, and social issues in an integrated way, has mostly emerged in non-legally binding international documents and is also referred to in several international treaties, including decisions from bodies under these treaties, in different ways and aiming at different goals, as shown above. We have also seen that international treaties referring to forests particularly seem to emphasise or concretise the economic and environmental dimensions of SFM. The social dimension remains neglected or hardly touched upon, mainly because this dimension is hard to measure considering the variety of forests and social contexts where SFM can be implemented. Nations that are party to the treaties have considerable freedom to formulate their own national policies and action plans regarding the use of their forests, including definitions and strategies for SFM. The next step will therefore have to examine whether states are succeeding in developing a coherent SFM strategy for the areas under their jurisdiction, and to what extent individual nation states have adopted an economically, socially, and environmentally integrated approach to SFM.

17.5 Outlook

Notwithstanding the difficulties that result from SFM's inherently fragmented character at an international level, there are some hopeful signs as regards the achievement of an implementable integrated strategy for it. First, although countries have to consider all treaties to which they are party, they have the possibility to develop a coherent approach towards SFM in the areas under their own jurisdiction, and to set an example that other countries may want to follow. This implies that fragmentation, as an inevitable characteristic of international law (International Law Commission, 2006, Article 247)[35] may not necessarily result in a barrier to SFM. In a pluralistic world it may encourage countries to pursue SFM within their own capabilities, possibilities, and preferences.

Another hopeful sign, although the political signs are still weak,[36] relates to the intention expressed in the United Nations Forum on Forests (UNFF) to revalidate and update the "Non-Legally Binding Instrument on Sustainable Forest Management for all Types of Forests", for the period after September 2015.[37] We hope that the acknowledged difficulties encountered in specifying and operationalising economic, social, and environmental needs related to forests will receive ample attention in this intended update by the United Nations Forum on Forests (UNFF). Jumping to a solution too fast, without sufficient consideration of what social, economic, and environmental needs actually imply, bears the risk of ignoring those domains that are relatively hard to measure or define, contributing to selective SFM regimes that only focus on services which can be easily measured (Quine, Bailey & Watts, 2013, p.867).

[35] See Report of the International Law Commission on its Fifty-eighth session, reference UN, 2006.
[36] See 'Draft ministerial declaration of the high-level segment of the eleventh session of the United Nations Forum on Forests - International arrangement on "The forests we want: beyond 2015"', reference UN, 2015b.
[37] See the 'Provisional agenda and annotations' of the United Nations Forum on Forests Eleventh session, reference UN, 2015a.

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Chapter 18

The role of 'soft' monitoring instruments for compliance with international climate goals[38]

Martina Kühner

[38] This chapter is based on previous work by the author published in Philipp Pattberg and Fariborz Zelli (eds.) (forthcoming), Environmental Politics and Governance in the Anthropocene: Institutions and Legitimacy in a Complex World, London and New York: Routledge.

Abstract

Learning about effective ways to ensure compliance with internationally agreed targets is key in times of aggravating climate change and other global challenges. This chapter is concerned with the following questions: What role do ’soft’ monitoring instruments play within the Compliance System of the Kyoto Protocol (KP), and what are their prospects in the post-2020 climate regime? It analyses the working of the Compliance System since 2006, by looking at the different instruments, ranging from ‘soft’ (facilitation) to ‘hard’ (enforcement). It argues that soft instruments and in particular the Expert Review Teams have played an important role in facilitating compliance with countries’ climate commitments. The chapter finds that it is the combination of soft and hard instruments that was particularly useful. Based on these empirical findings, derived from expert interviews, recommendations are given for the institutional design of a compliance monitoring architecture to be determined at COP21 in Paris in 2015 and beyond.

18.1 Introduction

It is widely acknowledged that it has never been an easy task to get states to agree on substantive commitments at international climate negotiations. The upcoming climate talks in Paris in December 2015 to agree on a new climate agreement after 2020 will most probably not be an exception to previous experiences. Nevertheless, the current framework, based on decisions of the United Nations Framework Convention on Climate Change (UNFCCC) of 1992 and, in particular, its Kyoto Protocol (KP) of 1997, could be seen, at least according to the UNFCCC itself, as an "important first step towards a truly global emission reduction regime that will stabilize GHG emissions" (UNFCCC, 2014). However, after the first commitment period of the KP in 2012, the world showed a mixed picture: the USA did not ratify the KP, and Canada quit the protocol just before the end of the first commitment period. This meant that only 36 developed countries and so-called countries in transition, which together accounted for 24% of global GHG emissions in 2010, were legally bound by the commitments in that timeframe (see also Box 18.1 below).

Box 18.1 Main facts about the Kyoto Protocol

- Six main greenhouse gases (GHG) are covered: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF_6).
- The individual emission reduction targets (the base-year most often being 1990) for the first commitment period (2008-2012) are listed in the Kyoto Protocol's Annex B, e.g. EU -8%, Japan -6%, Russian Federation 0%; no binding targets for developing countries (which also includes emerging economies such as China).
- Several countries, including the USA, signed the KP, but did not ratify it. Canada left the Protocol in 2012.
- For the second commitment period (2013-2020) 37 countries - representing less than 15% of current global emissions - committed to reducing their emissions by 18% compared with the base-year (most often 1990); major countries such as Japan, Russia, and New Zealand did not commit again.
- USA and China, the world's largest emitters, signed a bilateral agreement in November 2014, agreeing to peak emissions by 2030.

It is at least some good news that these countries collectively over-performed during that period, reducing their overall emissions by 24%. However, as Morel and Shishlov (2015) rightly pointed out, there were also eight countries that did not meet their country targets. But the underachievement of these countries was more than offset by the achievements of other countries. It is noteworthy that the targets agreed upon by the again rather small circle of signatory states of the second commitment period of the

KP cover an even lower percentage of global emissions, which is far from sufficient to stay below the often cited 2°C goal which would be needed to reverse the trend of global warming (IPCC, 2014). This leaves us with the alarming situation that in the run-up to the intergovernmental negotiations at the Conference of the Parties (COP 21) in Paris in 2015, a vast majority of GHG emissions are not governed under what was meant to be the "global" climate agreement, the KP. It is clear that a more far-reaching, ideally global climate deal needs to be agreed upon in Paris for the time after the KP expires in 2020, in order to keep global warming manageable. However, equally important as a broad and ambitious commitment are effective ways to ensure compliance with such commitments.

While the details of how the implementation of a new global climate deal is going to be monitored will most probably only be decided after COP21, it is important to understand and reflect now on lessons learnt from the compliance monitoring under the first period of the KP. As the deal expected from Paris will most probably differ in several respects from the KP, in particular regarding the reach and nature of commitments, lessons from the existing compliance monitoring cannot be transferred directly. Nevertheless, assessing the working of the monitoring set-up and its different features is helpful to determine policy options and develop informed opinions.

The KP Compliance System (CS) consists of both "soft" and "hard" monitoring instruments, which are worth examining. While the former type of instruments relate to measures such as rule clarification and assistance, the latter "entail some kind of costs for the party found in non-compliance" (Oberthür, 2014, p. 35). More specifically, soft instruments in the KP monitoring system are concerned with creating transparency of emission-related information and facilitating compliance with emission targets, while hard instruments have the power to sanction parties in case of non-compliance. Interestingly, the soft instruments can also have an effect, despite not having any punitive enforcement measures at their disposal themselves. In light of the scepticism among many governments towards hard and binding mechanisms in the climate negotiations, it is highly relevant to understand the value of soft instruments, as these might feature prominently in the new climate governance architecture.

Therefore, this chapter is concerned with the question: What role do "soft" monitoring instruments play within the Compliance System of the Kyoto Protocol, and what are their prospects in the post-2020 climate regime?

18.2 The compliance system of the Kyoto Protocol

In order to address the risk of non-compliance of Parties to the KP, the UNFCCC established a Compliance System (CS) for the KP in late 2005, with the aim of ensuring compliance with the agreed targets. This CS can be regarded as unique in its kind, as no other Multilateral Environmental Agreement (MEA) had been designed in such a way.

Within the CS, Parties have two main obligations: they are required to submit annual GHG inventories, as well as regular national communications to the Secretariat (UNFCCC, 2015a).

A key component of the CS is the Compliance Committee (CC). It is composed of two branches: the Facilitative Branch (FB) and the Enforcement Branch (EB). The FB's mandate is to provide facilitation and advice in order to enhance compliance (UNFCCC, 2015b). The branch consists of ten members (and ten alternate members) and can be regarded as a soft mechanism. On the other hand, the EB represents the "stick" within the CS. Its ten members (plus ten alternate members) deal with compliance issues, so-called questions of implementation that are addressed by the branch through one of the three possible triggers: self-trigger, through another Party, and the Expert Review Teams (ERTs) (see below). If the EB considers a country non-compliant, for example regarding its reporting obligations, the branch can apply sanctions such as suspension from the international carbon-market mechanism.

The monitoring of the KP relies on the so-called Measurement, Reporting and Verification system (MRV system). It is the basis of a functioning CS, as it ensures that the information needed to assess compliance is available and reliable. This is where the international ERTs come in: these independent experts have the task to review the validity of data provided by national governments, via either a desk study or a country visit. While the MRV system can formally be regarded as soft, a look at the practical functioning of the ERTs shows some interesting dynamics. This is partly linked to their mandate to trigger questions of implementation. Next to the Parties themselves (self-trigger and trigger through another Party), the third trigger is in the hands of the ERTs, which have the right to flag to the CC in case they find problems of compliance.

18.3 The working of the Compliance System – what role for soft instruments?

While the EB and the FB both took up their tasks in 2006, there are clear differences between them. Looking at the numbers of cases the two branches have dealt with up to now, the EB was far more active: in total it dealt with eight questions of implementation, while the FB had no case they could formally address. When considering only the number of cases addressed by the FB, one could conclude that this soft instrument has been neither very powerful nor useful. However, a look at another soft instrument shows a different picture. All questions of implementation have effectively been triggered by ERT reports (Oberthür, 2014, p. 41). This means that the Verification component of the soft MRV system has actually had the power to start compliance procedures. In addition, while according to the formal mandate the reviewing processes of the ERTs are of a purely technical nature, in practice a strong facilitative role was played by these experts. Interestingly, several disagreements, for instance regarding the correctness of numbers provided in the GHG-emission inventories, were solved by the ERTs and the concerned Party themselves. In consequence, no question of implementation had to be raised, avoiding a procedure in the CC (Oberthür & Lefeber, 2010, p. 147). This shows that the ERTs are not purely there to verify the data and do the technical preparatory work for possible cases to be dealt with by the branches. The fact that they actually have demonstrated the capacity to prevent questions of implementation shows their actual capabilities. This informal way of dealing with potential issues of compliance might be enhanced by the set-up of the compliance system. The actual "threat" perceived by a Party to be brought in front of the EB seems to play an important role. It can develop from a Party's fear of "losing face" in front of the other Parties and the domestic constituency when being asked a question on non-compliance. In particular, when the EB concludes that a country is in non-compliance, this can lead to substantial reputational damage. Thus, Parties have an interest in solving potential issues already at the level of the review by the ERTs, trying to avoid that the ERTs have to file a question of implementation to the CC. An additional explanation for this phenomenon can be found in the "peer review like nature" of the reviews. As the reviewers are often also involved in the preparation of the reports for their home countries, they have an interest in a constructive review which allows facilitation and learning: they know that their own country will be reviewed by an ERT, i.e. their peers, as well.

To conclude this short and rather tentative assessment of the role of soft instruments within the CS, one can observe that they do indeed have an important role to play. Next to being "the" trigger for questions of implementation, informal facilitation has also helped to prevent additional compliance procedures. Also, peer dynamics among reviewers and reviewed countries and the fear of "naming and shaming" can be regarded as a sort of "pre-emptive" stick that has incentivised countries to take the soft instruments seriously and as a possibility to prevent issues of compliance. Nevertheless, the existence of the CC, and particularly the EB, still remains crucial, as it somehow increases the size of the stick with the threat of economic and reputational sanctions in case problems with compliance are found after review by the ERTs. It seems to be precisely this interplay between the incentives and facilitation that the MRV process and, at least in theory, the FB provide, and the sanctions of the EB, which resulted in an enhanced level of compliance. This means that, while it is rather difficult to isolate the effects of the soft instruments from those of the hard instruments, the former appear to play an important role as an integral part of the CS. The fact that the Parties have by and large met their emission targets for the first commitment period cannot be causally attributed to this fact alone, but it has certainly contributed to this achievement.

18.4 What role for soft instruments in monitoring a new climate deal?

While the preparations for COP 21 are reaching their climax, it is interesting to ask what the monitoring of the future climate agreement might and should look like. Reflecting on the experience under the KP described above, it seems that the experiment of combining facilitation and enforcement has been relatively successful. On the enforcement side, all eight cases of non-compliance that the CC has dealt with so far, except Canada, resulted in the Parties returning to compliance. On the facilitative side, the ERTs have proved to be effective in preventing, as well as – where needed – triggering compliance procedures. It is only the FB which has had difficulties in finding its role. This was partly due to the nature of the questions on implementation issues raised, as they came under the mandate of the EB. Another reason may have been linked to the pragmatic approach by the ERTs described above, which dealt with issues that otherwise could have been referred to the FB. Together with the cases the EB dealt with successfully, the present study has shown that soft and hard approaches went hand in hand, which makes it difficult to say whether facilitation or enforcement approaches have been more important. According to a well-informed guesstimate by a high-ranking expert, soft instruments are sufficient in around 80% of the cases to help Parties comply. Only in around 20% of the cases are hard instruments needed to bring struggling or unwilling Parties back to compliance.

What can we learn from these insights for a new climate deal in Paris? Regarding the ERTs, it seems preferable, and is actually also to be expected, that their role will not change substantially with the new agreements, as their independent, factual and non-politicised work has so far been generally highly appreciated by the Parties. The fact that the reporting itself, as well as the review criteria applied by the ERTs, have been based on benchmarks and indicators of the Intergovernmental Panel on Climate Change (IPCC), a widely recognised independent scientific body, has added to the credibility and acceptability of the MRV process, including the assessments by the ERTs. It would therefore be conducive to the support for any future CS if this practice is maintained. However, the division of labour between the ERTs and the FB should be reconsidered, as there seemed to be some mismatch in terms of the mandate of the FB and the actual work the ERTs were doing. In any case, it would be desirable to strengthen the soft instruments. This is necessary, as it is far from certain, and actually rather unlikely, that Parties to the new climate deal will actually agree on having another CS with "teeth", meaning that it is well possible that the EB as it existed under the KP might not feature in the governance architecture of the next climate agreement.

Strengthening the soft instruments could be done by, first of all, further clarifying the tasks of the FB (or whatever it might be called in the new framework). Secondly, measures should be taken to enable the FB to actually fulfil its role. In order to strengthen a meaningful soft governance function of early warning and facilitation, it is critical for the branch to obtain timely data. This has not always been the case under the KP, due to delays in submissions by Parties and the fact that comprehensive data was only available every four years. Furthermore, the FB's pre-emptive function could be incentivised, for instance by encouraging the branch to be more proactive. In light of this, COP 21 should try to take these deficits into account and, for instance, discuss options for improving the Parties' reporting modalities, without increasing the burden of reporting disproportionally. One idea is to link reporting on climate action under a new climate agreement to other reporting commitments that states have, for instance for the newly adopted Sustainable Development Goals. SDG-13 on climate action will certainly overlap with national commitments at COP 21, so a smart merging of these two monitoring tracks might be efficient and beneficial for maintaining momentum on both processes. However, it is rather unlikely that governments will decide upon many details regarding compliance monitoring in Paris, as this depends on the nature of the agreement. For instance, in the (rather likely) case that no legally binding targets are agreed, the monitoring can, formally speaking, not be focused on "compliance" either, but rather on voluntary implementation or accountability.

Finally, it is important to mention that the possible effect of the soft elements discussed above within the climate change regime, and the new compliance architecture in particular, strongly depends on the level of ambition of the new agreement reached at COP 21. While the negotiations regarding how the future monitoring is going to be structured are underway, these discussions are not (yet) in the focus of most policy makers. A truly global climate agreement, with universal or at least a high degree of approval among countries, seems to be prioritised over a strong CS. Considering the very low coverage of the KP, it seems sensible to do so initially. Having major GHG emitters ratify a new deal will be key, but only as long as there are also effective ways to monitor their progress and hold them to account for their commitments afterwards. If the collective ambition level remains insufficient to limit global warming to below 2°C relative to pre-industrial levels – an obvious problem of the KP – then the value of the monitoring also remains limited. However, the question of how monitoring is going to be designed in the future agreement is most likely to play some role in the Parties' decisions to sign up for such a commitment. It looks as if a compromise solution between a strong compliance system on the one hand and a substantial participation of states on the other will need to be reached. The need for consensus might compromise any "stick" of the future monitoring framework, for the sake of enabling a global agreement to be reached.

To conclude, the decision on the reach of the agreement will be crucial as, after all, it impacts on the effect a future compliance monitoring system can have. After all, compliance monitoring should not be an end in itself, but a means to achieve the substantive goals of climate mitigation. This implies that emerging emitters such as China, India, Brazil, South Africa, but also Russia, will need to be brought "on board". Only once a large number of emitters is actually bound under the climate deal, will the question which instruments (or combination thereof) are most useful to monitor compliance actually become really relevant. So far, the Intended Nationally Determined Contributions (INDCs) submitted by states are still far from sufficient in terms of the required global ambition. However, the bilateral agreement between the USA and China in 2014, as well as the recent election outcomes in Australia and Canada, gives hope that a substantive global deal can be reached in Paris. Setting up an effective monitoring framework for these global commitments will be an additional challenge, and soft instruments should feature prominently in order to regularly remind Parties of their commitments and facilitate their compliance.

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Chapter 19

The law as an instrument for climate protection: the case of integrated approaches to understanding emissions trading[39]

Marjan Peeters

[39] This chapter builds on previous work by the author regarding emissions trading, which was concluded in February 2015. The new direction presented in this chapter is that it shows how the legal discipline can become part of integrated studies into greenhouse gas emissions trading.

Abstract

This chapter illustrates the need for cross-cutting studies regarding the question how the reduction of greenhouse gases emissions, particularly by means of “emissions trading”, can be regulated in an effective and efficient way within the boundaries of the rule of law. It identifies the following research challenges:

1) Typical legal concepts such as procedural rights and enforcement deserve combined studies in order to examine how to design and apply the law.
2) In-depth understanding is needed of the relationship between natural science and the legal discipline, not only in view of the justification that climate science provides for climate regulation, but also in view of the way the law can deal with scientific uncertainties.
3) Multidisciplinary research is needed to understand whether market-based regulatory interventions are suitable for developing countries, or whether other regulatory instruments are more suitable for countries with a potentially weak legal infrastructure.

19.1 Introduction

The huge transition needed to combat climate change not only asks for major societal and technological changes, but also for a major transformation of the law to provide effective regulatory instruments for the reduction of greenhouse gases. Much legal research is being done and still needs to be done concerning the basic question of what role the law plays in enabling the transition towards a low-carbon society, and part of this research deals with the design and application of regulatory instruments addressed to greenhouse gas emitters. The use of market-based regulation by means of "emissions trading" has become a major characteristic particularly of international and European Union (EU) climate law. This means that an understanding of the regulation of the greenhouse gas emission reductions requires economic and legal perspectives to be combined, together with insights from other disciplines like behavioural science, which investigates how actors react to different kinds of regulatory approaches. This chapter illustrates the need for cross-cutting and more integrative studies regarding the question how the reduction of greenhouse gases emissions, particularly by means of "emissions trading" can be regulated in an effective and efficient way within the boundaries of the rule of law.

19.2 Role of the law and choice of regulatory options

The law can basically be seen as a powerful instrument that governments can use to guide actors in society towards a particular policy goal, especially by means of regulations that impose enforceable duties on them. However, the law cannot simply be seen as a technocratic tool at the disposal of governments. In fact, the law determines whether and how governments may steer society, in other words, governments themselves have to respect legal boundaries.[40] This means, for instance, that administrative law principles like legal certainty (the law must be clear and reliable for those who are subject to it), proportionality (citizens' freedom should be limited by public authorities only to the extent necessary for the protection of the public interest), and the principle of equal treatment (decisions should not treat people unequally without stating a justified reason for doing so) have to be respected, in addition to human rights like the enjoyment of private property or the respect for private and family life.[41] In this sense, the law serves as an instrument for the government *and* as a

[40] The legal discipline, particularly classical legal positivism, aims to objectively identify the applicable law. Next to this, an activist oriented legal scholarship seeks to prescribe what the law ought to be. On legal scholarship see Gleider Harnändez, The activist academic in international legal scholarship, ESIL Reflections volume 1, issue 11, available at http://www.esil-sedi.eu/node/463 (accessed 30 January 2014).

[41] The meaning of these principles as part of the European legal systems is here represented in a very basic sense. On administrative law principles see C. Backes and M. Eliantonio, Administrative law, in: Jaap Hage,

guarantee for citizens and business against unlawful governmental intervention.[42] It also means that careful assessments are needed to ensure that governmental regulatory interventions are in accordance with the law. Only after a regulatory instrument has been adopted, will it become clear what its effects are in practice. Courts might find that a regulatory intervention is not in agreement with a higher law. As a result, a regulatory approach may turn out to be less effective than assumed, or hoped for, at the time of adoption. Both theoretical ex-ante studies (before a regulatory instrument gets adopted) and empirical ex-post studies (its application in practice and the gradual clarification of the opportunities and limits by means of case law) are needed to contribute, through legal research, to the realisation of effective regulatory approaches in view of the higher aim, that is, the transition towards sustainable development.

Interestingly, most societal problems are open to many different regulatory approaches. One can think of a toolbox of instruments, and the legislator usually has quite extensive freedom of choice from among the available tools. Regulatory measures may consist of (a) traditional interventions (like the classical top-down permit, where the government prescribes the behaviour of private actors), (b) economic interventions (for instance environmental taxes or grants) and (c) informational interventions (like the requirement to attach an energy label to a certain product).[43] Every regulatory intervention needs to meet the criteria of the law, including the economic and informational ones: while taxation, for instance, is often called an "economic instrument", since it clearly follows the market rationale by putting a price on environmental pollution, one should not forget that such a tax remains meaningless if it is not applied within a legal framework consisting of binding obligations and a related monitoring and enforcement mechanism. Without the law, economic regulatory instruments can hardly be applied. However, designing and applying legal frameworks for these market-based instruments may face many challenges and problems. This is particularly true when new regulatory models are being applied, as is the case with emissions trading for the reduction of greenhouse gases.

19.3 Emissions trading: legal perspectives

Emissions trading has originated in the economic literature, and only later entered legal literature and practice. The appealing and simple idea discussed by the economist J.H. Dales in 1968 of putting a cap on pollution while distributing tradable emission rights by

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Bram Akkermans (ed.), Introduction to Law, Springer 2014 p. 196-197, and, more elaborately, for instance: Xavier Groussot, General Principles of Community Law, Europa Law Publishing, 2006, p. 20-26.

[42] Moreover, the law provides rights and tools to victims enabling them to claim damages and to prevent potential damage; the law also provides rights to organisations, including environmental organisations, enabling them to pursue their interests.

[43] Richard B. Stewart (2007). Instrument Choice, In: Daniel Bodansky, Jutta Brunnée and Ellen Hey, The Oxford Handbook of International Environmental law, pp. 147-181, Oxford University Press.

means of an auction has been intensively discussed by economists.[44] After its conception in the literature, the idea has been put into practice, first in the USA for combating acid rain emissions, applicable from 1995 onwards. After this, the "world" embraced the instrument in concluding the Kyoto Protocol in 1997 (as part of the United Nations Framework Convention on Climate Change established in 1992). The adoption of emissions trading was complementary to the establishment of binding emissions reduction targets for developed countries, as a means to achieve those targets in a cost-effective way. It is remarkable to see how quickly emissions trading became part of a treaty, resulting in an international carbon market encompassing not only developed but also developing countries. However, the USA refused to accept emission reduction targets by ratifying the Kyoto Protocol, although they were at that time the most experienced country as regards emissions trading. In contrast, in order to comply with the emission reduction target of the Kyoto Protocol, the EU has adopted the instrument in the form of an EU-wide greenhouse gas emissions trading scheme, whose first trading period started in 2005.[45] Practice shows that the instrument is not functioning optimally: elaboration of the rules of the emissions-trading instrument in a political environment leads to deviations from theoretical models.[46] Moreover, in the course of drafting the instrument, the legislative framework for emissions trading needs to be fine-tuned to the specific pollution problem being regulated, the prevailing political preferences, and the legal system in which the instrument will be applied. There are, for instance, major challenges with regard to the design and application of the mechanisms to *distribute* the tradable rights among potential polluters. While economic theory has proposed the auctioning of emission rights, free allocation – being less burdensome for the industries covered – has been largely preferred in reality, at least in the US acid rain emissions trading scheme and in the first phase of the EU emissions trading scheme.

Law scholars can contribute to a further understanding of the instrument of emissions trading by focusing on two core topics that are characteristic of the legal discipline: (a) procedural rights and (b) compliance and enforcement.

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[44] Dales, J.H. (1968), Pollution, Property and Prices, An essay in Policy-making and Economics, republished in 2002 by Edward Elgar; Tietenberg, T.H. (2006), Emissions Trading, Principles and Practice, 2nd edition, Resources for the Future; see also his emissions trading bibliography posted at http://personal.colby.edu/~thtieten/trade.html accessed 10 February 2015.

[45] Directive 2003/87, as amended; see for instance B. Mortensen (2004). The EU Emission Trading Directive, European Environmental Law Review, 13: 275-284.

[46] The OECD evaluated the functioning of the acid rain trading system quite positively, see: OECD (2004). Tradeable Permits. Policy evaluation, design and reform. The EU ETS directive, however, was reformed in 2009 (and is still under construction) in order to try and improve its design (EU Directive 2009/29), see for instance M. Peeters, S. Weishaar (2009). Exploring Uncertainties in the EU ETS: "Learning by Doing" Continues Beyond 2012, Carbon and Climate Law Review, 1/2009, p. 88-101, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1324876; J. Skjærseth (2008). Implementing EU emissions trading: success or failure? International environmental agreements, 8(3), pp. 275-290; Astrid Epiney (2012). Climate Protection Law in the European Union. Emergence of a New Regulatory System, Journal for European Environmental & Planning Law, Volume 9, Issue 1, pp. 5-33.

Procedural rights represent a very typical strand in the environmental law literature, consisting of access to information, the right for the public to participate in governmental decision-making, and access to the courts to enforce such rights, thereby particularly strengthening the position of Environmental Non-Governmental Organisations. The Aarhus Convention was the first treaty to establish a framework of procedural rights in environmental matters. It has Pan-European coverage, and its Parties include 46 countries from Europa and Central Asia, as well as the European Union.[47] However, the procedural rights of the Aarhus Convention seem to be designed for the more traditional legal approaches, like permitting. As soon as a different regulatory instrument is introduced, like emissions trading, there is a need to interpret how the well-known procedural rights can be applied. A very specific question is, for instance, whether the public should get access to information about emission rights transfers, and whether the public should get any say in the transfers of such rights, for instance when states make use of emissions trading.[48] For such a specific issue, collaboration with economists specialising in market design and the importance of the confidentiality of information in order to let the market do its work seems necessary to understand to what extent access to information regarding emissions trading data can be provided, and whether inter-state deals, like a deal between a developed and a developing country, should or may remain confidential. Another opportunity for cross-cutting research is to examine the intrinsic value of procedural rights. It is commonly expected that procedural rights enhance the quality of governmental decision-making, but further theoretical and empirical research is needed to evaluate under what circumstances and through which methods of public consultation (for instance through national or European emissions reduction plans or policies) this is indeed the case.

Second, a typical legal focal point is compliance with set standards and the means of enforcement. In order to promote compliance, legal frameworks need to be set up for behaviour monitoring and punishment. Examination of the way in which monitoring may be realised and the imposition of different kinds of sanctions incorporates many different legal aspects, including the protection of human rights, which have a two-fold meaning: on the one hand, enforcement authorities need to respect the guarantees provided by human rights against unlawful enforcement action, and on the other hand, the human right to enjoy private and family life (and, in this vein, to be safeguarded from serious pollution) may require governmental action to enforce environmental standards. Not only lawyers, but also economists pay attention to the design of enforcement approaches.[49] Here, the legal and economic perspectives may strengthen

[47] See http://www.unece.org/environmental-policy/treaties/public-participation/aarhus-convention.html.

[48] CJEU, Case C-524/09, Ville de Lyon v. Caisse des dépôts et Consignations.

[49] See for instance Nobel Prize winner Gary Becker, Crime and Punishment: An Economic Approach, in: Gary S. Becker, William M. Landes, eds. (1974). Essays in the Economics of Crime and Punishment, UMI, available at: http://papers.nber.org/books/beck74-1.

each other, also by means of the existing cross-cutting “law and economics” discipline.[50] Moreover, since emissions trading is already being applied in practice, (in an interdisciplinary approach), ex-post evaluations can be conducted to examine how the legal enforcement provisions work. See Box 19.1 below for an example of current case law practice.

Box 19.1 Case Law example

> The highest court in the EU, the Court of Justice of the EU, appears to take a very strict approach regarding the imposition of sanctions. This case concerns a very high financial penalty for a Swedish firm that had not surrendered sufficient tradable greenhouse gas allowances before the set deadline, which had happened (according to the defender) because of an administrative error.[51] The case illustrates how points of view can differ regarding the applicable law: the advisor to the Court, the Advocate General, stated that a proportional approach could be taken, taking into account the administrative error on the part of the industry, which is less serious than a deliberate act to pollute the environment, whereas the Court itself adhered to a very strict approach to sanctioning, which does not provide the option of considering specific circumstances on the part of the offender.[52] The rationale behind the strict approach is most likely that a severe and “automatic” penalty is needed, in view of the market-based type of regulation, to deter future illegal behaviour. Whether this point of view is reasonable deserves further research, including legal, economic, and behavioural science experts.

19.4 Regulating greenhouse gas reductions: a call for more integrative studies

Having introduced two specific legal topics and the opportunity for cross-cutting research, we can indicate two additional, more fundamental and complex, research challenges.

First, climate science is a complex and integrated research field for which many different disciplines are relevant. The output produced by natural science to improve our understanding of the climate system is obviously relevant for regulatory action. For instance, the reason for taking regulatory action – which means that the government

[50] For a more general treatment of an integrated approach to law and economics and environmental economics, see Michael Faure, Göran Skogh (2003), The Economic Analysis of Environmental Policy and Law, Edward Elgar.
[51] C-203/12 , Billerud Karlsborg AB v. Naturvårdsverke.
[52] For a comment to the case (in Dutch), see Tijdschrift voor Milieu en Recht (2014), vol 2, jur nr 21 pp. 99-100.

intervenes in the freedom of economic actors and citizens – has to be based on sound climate science, indicating – as far as is possible – to what extent anthropogenic greenhouse gas emissions contribute, in whole or in part, and if so for what part, to global warming and climate change. Climate science may also indicate which greenhouse gases are damaging, with what intensity, and which concrete mitigation action is most effective. In this sense, climate science provides input to regulation: who exactly is the polluter, and to what extent? Based on this information, there is a need to examine, from a legal perspective – together with other perspectives like the economic and behavioural perspectives – what kind of regulatory action can take place: in addition to emissions trading, other regulatory instruments are also available, and it is even possible to apply a mix of instruments. The law also plays a role, however, if climate science cannot produce sufficient proof, since courts may be confronted with the question whether governments can ask private actors to take action, at their own costs, even if there is no clear evidence of potential future damage. In this context, the widely recognised precautionary principle plays a role, although the legal status and implementation of this principle are still being discussed.[53] This is relevant, for instance, when deciding on the total amount of emissions that will be distributed through the emissions trading instrument. Here, an interesting but complex link exists between, on the one hand, the limits of natural science in specifying in detail the anthropogenic causes of climate change, and on the other hand the challenge for the law to fill this gap by allowing for regulatory intervention without full proof. Further cooperation is needed in this respect between natural and legal experts.

Second, the instrument of emissions trading has so far been applied only in the legal systems of several developed countries. Since climate change needs to be addressed by all legal systems across the world, based on the principle of common but differentiated responsibilities that basically justifies differentiation of commitments across developed and developing countries, there is a need to explore whether emissions trading is also worthwhile to be considered in developing countries.[54] Obviously, such studies should not use a legal-technocratic approach, but have to incorporate social studies that show to what extent the institutional framework of a country is solid enough to handle the distribution of the allowances – which is most probably sensitive to fraud, particularly in the case of free allocation of the allowances – and the implementation of monitoring and enforcement tasks in a specific country. In this respect, it is particularly the right to choose from among the toolbox of available regulatory instruments that should be part

[53] See for instance Nicolas de Sadeleer (2007). Implementing the Precautionary Principle: Approaches from the Nordic Countries, EU and USA, Earthscan. On the precautionary principle and EU emissions trading see Astrid Epiney (2004), Climate Protection Law in the European Union. Emergence of a New Regulatory System, Journal for European Environmental & Planning Law, Volume 9, Issue 1, pp. 5-33.

[54] Michael Faure, Marjan Peeters, Andri Wibisana (2006). Economic instruments: suited to developing countries?, In: Elaborating on integration of environmental legislation: the case of Indonesia, in: Michael Faure, Nicole Niessen (eds.), Environmental Law in Development; Lessons from the Indonesian Experience, Edward Elgar 2006, p. 218-284 (http://ssrn.com/abstract=2361420).

of the discussion, since more traditional command-and-control instruments might fit in better with weak institutions (and be less sensitive to fraud) than the market-based instruments. Such a choice, however, needs to be examined from a multidisciplinary social science perspective.

For the near future, it is to be expected that several countries around the world, including countries like China, Brazil and Kazakhstan, will (or will consider to) apply emissions trading as part of their national climate policy.[55] For each and every country, the specific institutional and other circumstances within which the instrument will be developed and applied need to be examined, which would appear to require integrated approaches incorporating legal, economic, and socio-cultural perspectives. Numerous design and implementation questions have to be answered, with careful balancing of the characteristics of the legal, economic, and social system within which the instrument will be applied; one cannot simply “transplant” the EU or USA emissions trading model to countries like China. Large differences between legal systems, however, do not mean that some comparative research would be useless: instead, taking into account the large differences, one could try to learn lessons from successes and failures achieved with existing applications.

19.5 Conclusion: in search of integrated research opportunities within the limits imposed by complexity

Further research is needed for an understanding of the potential contribution of emissions trading (and other forms or regulation) to the mitigation of greenhouse gases and, in a wider perspective, to sustainable development. Socio-economic consequences of carbon trading can be examined by means of integrated research, which could include combining economic perspectives on regulation with human rights examinations. However, in-depth legal research is still needed, since, for instance, the design and application of procedural rights and of enforcement provisions need to be better understood. In this respect we are still in a learning phase. Next to this mono-disciplinary approach, one could experiment to see how law can become part of multidisciplinary and more integrated research towards market-based regulation. Conversely, other disciplines can take up the challenge to cooperate with legal scholars to provide new insights into and comments on legal concepts and, more closely related to practice, on the potential development of legislation and court procedures.

How exactly more integrative research incorporating the legal discipline can be done needs to be further understood. Indeed, while the legal discipline as such is already perceived to be very complex – since the law itself, particularly environmental law, has become increasingly difficult to master, also because it is part of the globalising world

[55] https://icapcarbonaction.com/ets-map. Some countries have already started this; see the website map.

with multilevel and polycentric regulatory approaches – conducting multidisciplinary and integrative studies may further increase the complexity of research. Only by undertaking such studies will it become clear how or to what extent cooperation can realistically contribute to the furtherance of sustainability science.

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Chapter 20

Disentangling the causal structure underlying environmental regulation

Julian Blohmke, René Kemp and Serdar Türkeli

Abstract

In this chapter we seek to disentangle the causal structure underlying environmental regulation with the help of Structural Equation Modelling (SEM) for a data set of 47 countries. SEM is a method for estimating revealing causal structures, allowing the analyst to examine whether the influence of variable A occurs in combination with variable B through variable C or through D, as co-determinants of E. Green advocacy and strong governance capacity are the main structural determinants of environmental regulation stringency. Internet access has a positive influence on environmental regulation through green advocacy and governance capacity. The influence of green advocacy and governance capacity on international environmental governance takes place through national environmental policy, while international environmental governance is also influenced by factors beyond the scope of this chapter. Statistically, 92% of the variance of environmental policy output was explained by our structural model, which is very high for a model incorporating only structural factors.

20.1 Introduction

Almost all countries have adopted environmental policy measures, with different degrees of regulatory stringency (OECD, 2013). The development of such policies is generally believed to depend on many different factors: green politics, a capable and well-staffed administration responsible for green issues, international pressures (such as the environmental acquit in the case of the accession countries in the EU), lobbying by green business actors, and acceptance by polluters.

The present study is an attempt to disentangle the causal structure and structural determinants of environmental policy, with the help of a rigorous analysis in the form of Structural Equation Modelling (SEM). SEM is a method for revealing causal structures, allowing the analyst to examine whether the influence of variable A occurs in combination with variable B through variable C or through D, as co-determinants of E. We sought to disentangle the causal structure underlying environmental regulations with the help of SEM for a data set of 47 countries, distinguishing between the influence of *proximate* factors such as governance capacity and demand for environmental regulations (from green business and green activists) and *background* factors such as democracy, internet access, environmental knowledge, and social cohesion.

20.2 Determinants of environmental policy

No fully-fledged theory of environmental policy making exists, but useful attempts to build one have been made. One relevant scheme is the framework of environmental policy diffusion created by Tews et al. (Tews, 2005). This framework makes a distinction between horizontal and vertical diffusion of environmental policy. Horizontal policy diffusion occurs when environmental policy is transferred from lead countries to other countries, while vertical diffusion takes place when international organisations set policies which are being implemented by countries. The different factors in this approach are grouped into two categories (Tews, 2005): (i) dynamics of the international system and (ii) national factors.

Given the sovereignty of nation states, national factors are viewed as decisive for the various designs of environmental policies across countries (see also Kern, Jörgens, & Jänicke, 2001). Whether governments want to adopt an environmental policy agenda depends on their institutional capacity, and these national capacities set the limits to policy innovation. Distinct country characteristics as well as a country's structural framework can influence national environmental policy (Tews, 2005). Relevant country characteristics include the size of a country, its market volume, and its contextual reputation (Tews, 2005), but they are not determinants of environmental policy.

The structural determinants of environmental policy are: environmental policy capacity, green parties, green advocacy coalitions, knowledge about environmental problems, active or passive support for regulations among the wider public, and acceptance of regulations by business and citizens who are directly affected by them (Jaenicke, 2005; Vogel, 1986). Put differently, environmental policy capacity refers to "a society´s ability to identify and solve environmental problems" (OECD, 1994, p. 8).

Environmental policy theory has been based on interest groups and constitutional structures (summarised in Oates & Portney, 2003) but has offered a rather crude description of interactions and failed to consider wider structural conditions and distal factors such as the role of environmental knowledge. We opt for a different approach, building on the work of Martin Jaenicke and other scholars, which is based on political-institutional and cognitive-informational framework conditions (Jaenicke & Weidner, 1997, p. 11; Mason, 1999). The former describe more structural conditions as requirements in the policy cycle, ranging from sensing a problem, agenda setting, and target formulation to decision and implementation (Jaenicke, Kunig, & Stitzel, 1999). An important element of political-institutional structural conditions is "green" advocacy coalitions of private and public actors (Sabatier, 1999), including civil society engagement in creating a sustainable future as well as the strength of the green industry in a country. Further potential political-institutional factors include the government's effectiveness, the competence of civil servants, and the quality of bureaucracy. The cognitive-informational framework conditions are systemic preconditions that relate to individuals' values and knowledge, and the communication channels through which they learn and express themselves. These can involve the degree of democratisation, access to the internet, environmental knowledge generation, and interpersonal trust.

It is important to note that not only structural but also economic factors can influence the policy output. Higher levels of national income and individual disposable income increase the availability of financial and technical resources and can improve the capabilities of a system to solve environmental problems (Jaenicke, 2005). The influence of this factor was tested post hoc (in the structural equation model analysis and in a separate linear regression analysis) but it was found not to have a significant influence, which is why we have not included it in our model.

In the following we discuss each of the types of conditions, starting with the political-institutional framework conditions, which directly influence the environmental policy-making process (as proximate factors).

20.3 Methodology and model

The determinants of environmental policy were investigated with the help of a Structural Equation Model (SEM) incorporating manifest and latent variables based on partial least squares. This is the preferred method when the theory underlying a structural model is not well established (Hair, et al., 2014). It allows the inclusion of unobservable, latent variables, which are measured indirectly by indicator variables (Hair et al., 2014). The inner model describes the relationship between independent and dependent latent variables, while the outer model, also known as measurement model, specifies the relationship between observed indicators and the latent variables.

All variables are structural variables and are measured at a high level of aggregation (at country level). The analysis is restricted to the systemic conditions for policy-making action and investigates the normative and particular organisational aspects of policy mechanisms (polity) as the basis for the choice of instruments and national decision making (Jaenicke, 1992). Our approach does not allow us to analyse the choice of policy instruments (policy), nor does it enable us to analyse the policy-making process (the wheeling and dealing between politically active parties involved in environmental policy making).

The structural model (see Figure 20.1) consists of the constructs of Green Advocacy, Awareness, and Governance Capacity as independent latent variables, constituting “environmental policy capacity” and influencing the dependent latent variable of Environmental Policy. All manifest variables directly or indirectly constitute the national drivers (stimuli) for Environmental Policy. We hypothesised that Green Advocacy and Governance Capacity represent the political-institutional conditions of the polity, which is categorised into the two groups of manifest variables, Public Sector and Private Sector/Individuals. Awareness represents the construct for cognitive-informational conditions. The construct of International Environmental Governance interacts with national Environmental Policy. The direction of causality of this link (see Figure 1, option 1 or 2) is discussed below.

We postulate that cognitive-informational framework conditions, the capacity to generate and effectively distribute knowledge, influence the political-institutional framework conditions. However, we hypothesise that Awareness does not directly influence the policy output. Policy output is believed to stem from the interactions of green advocacy actors with the administration and political actors.

The following data were used in the analysis (see also Table 20.1 below). *Environmental Activism* exemplifies the degree to which civil society at local level cooperates with the local governments to create a sustainable future. *Competitiveness of Green Industry* is a measure of the innovative strength of environmental technology sectors and their power in the policy-making process. *Government Effectiveness* describes the competence of civil servants and the quality of bureaucracy which enhances a society’s ability to effectively translate environmental concerns into regulation. *Democratisation* supports the transparent flow of information and helps citizens to express their concerns about environmental problems. *Internet Access* enables quick and inexpensive access to information. *Interpersonal Safety and Trust* represents social cohesion, enhances effective linkages among individuals, and lowers the transaction cost of information sharing. *Publications in the Environmental Domain* (environmental knowledge) promote decision-making with regard to environmental issues.

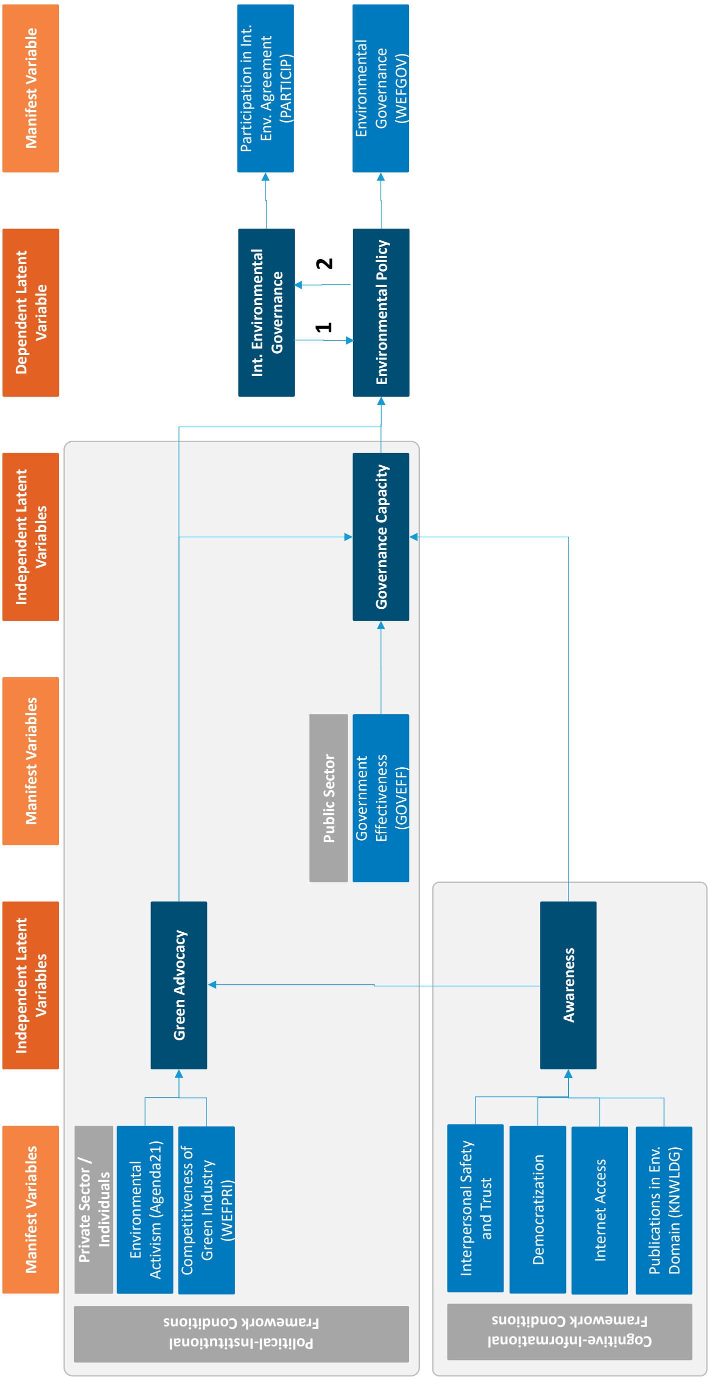

Figure 20.1 Determinants of environmental policy conditions and influences of environmental policy
Source: own illustration, related to Jaenicke (2005).

Table 20.1 Data description

Environmental Activism	Abbreviation: AGENDA21	Unit: Number of Local Agenda 21 initiatives per million inhabitants	Source: ESI, 2005	Year: 2001
Competitiveness of Green Industry	Abbreviation: WEFPRI	Unit: Min.: 7.2 Max.: 15.09=high World Economic Forum Survey on private sector environmental innovation	Source: ESI, 2005	Year: 2003/4
Government effectiveness	Abbreviation: GOVEFF	Unit: Indexed between 0 and 1=high level of effectiveness	Source: World Bank	Year: Average 2000-2002
Democratisation	Abbreviation: Democratisation	Unit: Trend-adjusted 10-year average score with high values corresponding to high levels of democratic institutions	Source: Polity IV (ESI, 2005)	Year: Average 1993-2002
Internet Access	Abbreviation: Internet Access	Unit: Internet access per 100 people	Source: World Bank	Year: Average 2000-2002
Publications in the Environmental Domain	Abbreviation: KNWLDG	Unit: Min.: 1.67 Max.: 74.67 Average rank with low values corresponding to above-average performance	Source: ESI, 2005	Year: 1993, 1998, 2003
Interpersonal Safety and Trust	Abbreviation: Interpersonal	Unit: 0=low, 1=high	Source: ISS, 2011	Year: 2000
Environmental Governance	Abbreviation: WEFGOV	Unit: Min.: 15.3 Max.: 59.74 World Economic Forum Survey on Environmental Governance	Source: ESI, 2005	Year: 2003/ 2004
Participation in international environmental agreements	Abbreviation: PARTICIP	Unit: Min.: 0 Max.: 1=full participation (score)	Source: ESI, 2005	Year: 2004

The indicator we use for Environmental Policy is the measure of *Environmental Governance* used in the World Economic Forum Survey on Environmental Governance. The indicator we use for International Environmental Governance is *Participation in international environmental agreements* as used in the Environmental Sustainability Index (ESI, 2005). The first indicator, Environmental Governance (for Environmental Policy), is a composite indicator based on the following variables: clarity and stability of regulations, flexibility of regulations, environmental regulatory innovation, leadership in environmental policy, consistency of regulation enforcement, and environmental regulatory stringency. It is based on respondents' subjective assessment of these variables. The second indicator, Participation in International Environmental Efforts (for International Environmental Governance), has an objective basis, as it is based on the signing of treaties. The second indicator does not cover the full range of national environmental policies, and does not measure relevant details of such policies (stringency, synergies and inconsistencies, enforcement) but adds an objective element which is missing from the first indicator. In the absence of a perfect indicator for environmental policy, we decided to investigate the causal structure for two indicators of environmental policy output. For the constructs we used single indicators.

The data set was adjusted by carrying out a missing values analysis to ensure the validity of our analysis. Since, for example, more than 5% of the data cases for the variable of Publications in the Environmental Domain are missing (Hair et al., 2014, p. 51) we chose not to revert to mean replacement algorithms but apply case-wise replacement of missing values (Ringle et al., 2010). This reduced our set of observations from 71 to 47 country data sets (see Table 20.2 below).

Table 20.2 List of countries

Argentina	Ecuador	Jordan	Romania
Australia	Estonia	Latvia	Singapore
Austria	Finland	Lithuania	Slovenia
Belgium	France	Malaysia	Spain
Bolivia	Germany	Mexico	Sri Lanka
Brazil	Greece	Netherlands	Sweden
Bulgaria	Hungary	New Zealand	Switzerland
Canada	India	Nicaragua	Thailand
Chile	Ireland	Norway	Ukraine
China	Israel	Peru	United Kingdom
Colombia	Italy	Poland	United States
Denmark	Japan	Portugal	

20.4 Results and discussion

Of the three constructs representing the independent latent variables, Green Advocacy and Governance Capacity are most strongly associated with Environmental Policy (see Figures 20.2 and 20.3 below). The most important factor underlying Green Advocacy is Competitiveness of Green Industry (WEFPRI), which suggests that the demand by green businesses for Environmental Policy is more important than the Environmental Activism of civil society (AGENDA21). This is an important conclusion, which fits in with the theory (Jaenicke, 2005). Overall, the strength of the effect of Green Advocacy on

Environmental Policy is similar to that of Governance Capacity, according to the path coefficients and significance levels. This is an interesting finding because Green Advocacy incorporates environment-specific aspects, while Governance Capacity does not constitute explicit administrative capacity in the environmental domain. At the same time this is a limitation of our analysis, since there are no data available on the strength of environmental administration (which would be part of Governance Capacity) beyond the European Union countries.

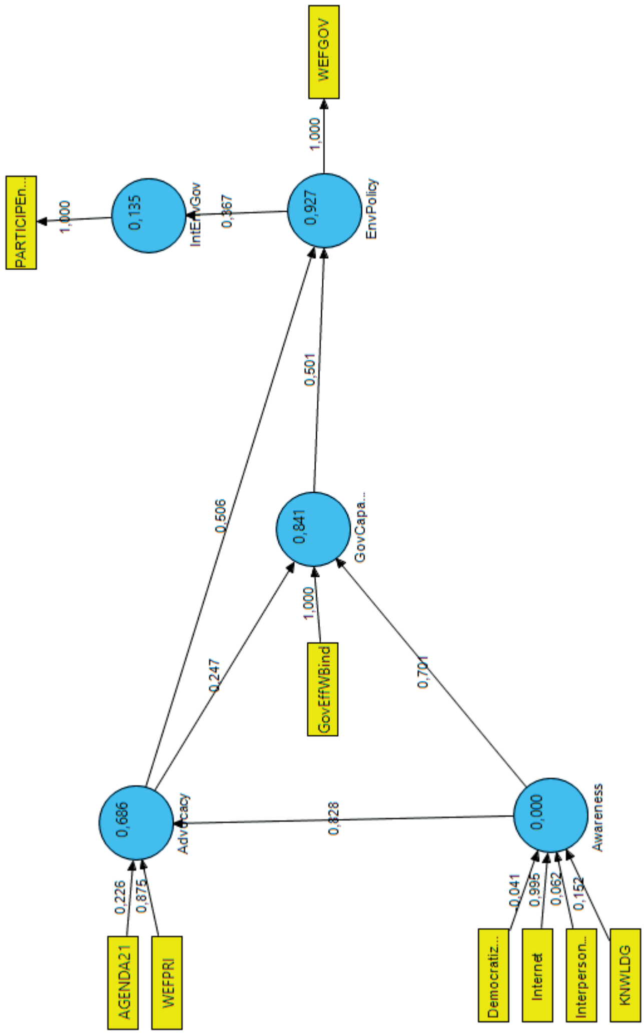

Figure 20.2 Coefficient values of Structural Equation Model

Source: based on own calculations using SmartPLS (Ringle et al., 2005). Threshold value for coefficients is 0.2. The outer loading is always 1.0 in single item constructs. Coefficients in measurement models are always between -1.0 and 1.0. The closer the number is to -1.0 or 1.0 the larger the effect of the item. Value in circle represents R^2.

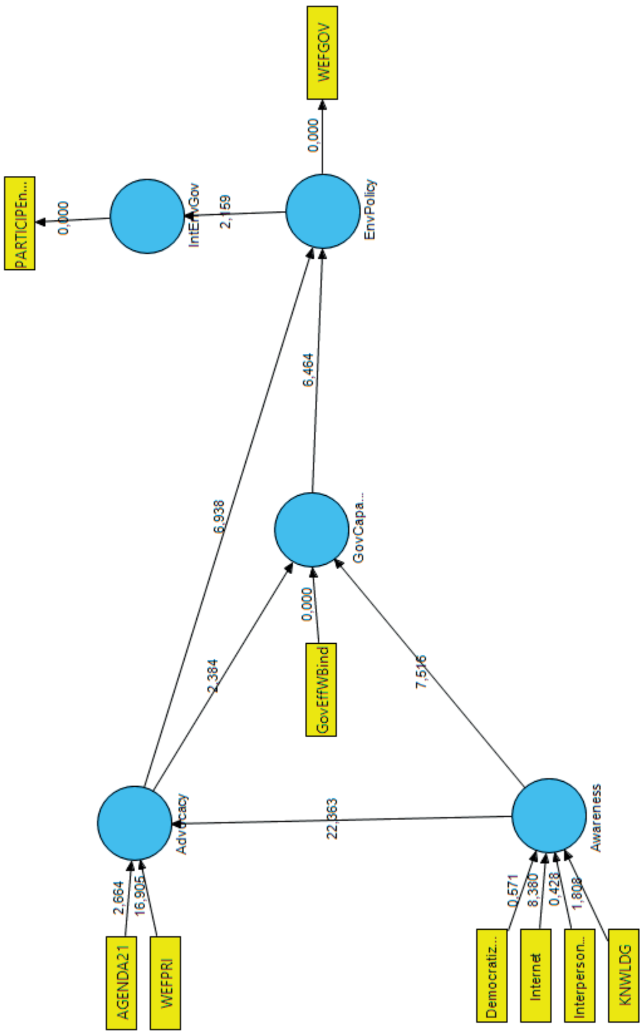

Figure 20.3 Significance values of Structural Equation Model

Source: based on own calculations using SmartPLS (Ringle et al., 2005). Threshold values for significance of 1%, 5% and 10% probability of error are 2.57, 1.96, and 1.65 respectively. Single item constructs do not have a significance level.

Internet Access is also positively associated with Environmental Policy. The influence is found to act through Advocacy and Governance Capacity, so the nature of their impact is associated with the distal, cognitive-informational framework conditions. Other studies have observed that access to information positively influences environmental performance (Esty & Porter, 2005), and we put this finding in context with other influences. The influence of Knowledge is non-significant. The ambiguity of its categorical influence on environmental policy making is evident and has been confirmed by others as well (Krott & Suda, 2007).

Economic wealth, in the form of per capita GDP, as a separate construct, does not have a meaningful influence on Environmental Policy in our structural model. This shows that the other constructs we use in our model are robust and do not change much when economic wealth is included in the model. Nevertheless, economic wealth does have an influence on environmental policy (Esty & Porter, 2005 showed that per capita GDP has a positive influence on environmental regulatory stringency), while our analysis of polity drivers does capture it adequately.

It bears noting that the analysis of causal structures underlying environmental regulation is subject to several limitations which give guidance to future research. First, the interaction between international environmental governance and national environmental policy is not appropriately measurable with the proxy of Participation in Environmental Agreements (PATICIP). This construct requires further indicators or time series, which we do not have, to explore the international environmental policy-making dynamics in greater detail. Second, we only analysed the influence of structural determinants. In doing so, we do not want to deny the influence of strategic action in the form of wheeling and dealing and the role of the media, but our approach does not allow us to analyse such factors. Third, the influence of resistance from polluters as a negative factor, this could not be analysed because there are no statistics or any good proxies for counteracting advocacy forces. Fourth, reverse causality could not be tested simultaneously in our structural equation model, which clearly deserves further investigation, since it can be assumed that Environmental Policy and Competitiveness of Green Industry (WEFPRI) influence each other. In fact, Environmental Policy (WEFGOV) and Competitiveness of Green Industry (WEFPRI) are significantly and positively correlated (R^2 of 0.82), which could be seen as a confirmation of the Porter hypothesis (Porter & van der Linde, 2005). A final limitation, holding true for all quantitative analysis, is that all variables are subject to measurement problems. The use of different manifest variables to some extent helps to circumvent this problem. Of the various measures, we consider the construct of Government Capacity as the weakest measured variable. This is caused by the absence of information on the size and quality of environmental protection agencies or representation of green interest in parliament in the countries investigated.

Despite several limitations, the results appear rather plausible. They fit in quite well with the empirically grounded propositions by Martin Jaenicke, in particular that national green industry competitiveness and cooperation with the government have a strong positive link with environmental policy output. In addition, access to information through the internet, via the political-institutional framework, also positively contributes to environmental policy making.

It becomes apparent that the process of environmental policy making involves multiple domains, from awareness of individual interests to institutional capacities which are part of human and institutional systems. These systems are characterised by a certain complexity in their functioning and outcomes due to uncertainty in the underlying domain of environmental problems and the multitude of individual perspectives and interactions between the sub-systems, while at the same time the development of environmental regulations does not follow a linear path (Funtowicz et al., 1999).

Statistically, 92% of the variance of environmental policy output was explained, which is very high for a model incorporating only structural factors. Thus, Structural Equation Modelling (SEM) constitutes an important avenue for building a theory of environmental policy making and testing hypotheses. We propose that it should be used more in political science and political economy analysis.

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Chapter 21

Assuming change for the better: the role of assumptions in a change programme on food consumption

Julia Backhaus and Harro van Lente

Abstract

“We need to change people’s norms and values” is a frequently heard proposition in discussions about changes towards more sustainable ways of living. A widespread assumption, also held by the large majority of participants in a recent study, is that educating children about healthier and more sustainable behaviours helps to achieve such change in lifestyle. This chapter traces how people involved in change initiatives subscribe to assumptions about what is at stake and how change can be achieved. The notion of sensemaking (Weick, 1995) is central to our analysis of the way assumptions work. The case discussed is a dietary change initiative for German schoolchildren. The findings of this initial study show that – irrespective of their veracity – assumptions matter because they inform and guide actions. Our findings show how assumptions based on personal beliefs, previous experiences and (strategic) evaluation find their way into the construction, implementation and outcomes of an initiative targeting lifestyle changes.

21.1 Introduction

Consumerist lifestyles in the Western world and among the wealthy across the globe are blamed for the many social, economic, and environmental problems that current and future generations are faced with. For decades now, calls for change towards sustainability have been becoming more and more numerous, urgent and loud. Not only is it a challenge to agree on the kind of change needed, but another question is how to bring about any kind of change. These two questions are closely related, of course, because a change strategy always hinges on problem definitions and politics: what is regarded as the problem and who is considered to be the main causer of that problem?

One possible strategy to stimulate sustainable living is to educate children about sustainability and the impact of behaviours. In a survey carried out as part of the co-funded EU project POLFREE in the winter of 2013/14 among more than 1,200 households in Austria, Hungary, and the Netherlands, almost 90% of all respondents considered educating children about resource consumption to be a desirable or very desirable measure to tackle sustainability-related challenges. In addition, more than 75% of all respondents indicated that they expected this approach to be effective or even very effective. Thus, it is a prevalent assumption that educating children is a powerful way to stimulate sustainable living.

Social science theories stress that assumptions shape actions that make up the world we live in (Thornton, Ocasio, & Lounsbury, 2012). Assumptions about the way change can be brought about shape sustainability initiatives, regardless of their validity. Such underlying, yet often unacknowledged assumptions include definitions of what constitutes sustainable living, how it can be achieved and supported and who should be involved and how. Thus, it is clear that assumptions matter – it is less clear, however, *how* they matter. Based on a case study of an educational initiative aimed at lifestyle changes among children, this chapter deals with the way people who engage in change initiatives define what is at stake regarding a more sustainable future, and how it can be achieved. Before considering the case, however, we turn to social science theories of how people generally make sense of the world and how their actions are influenced by others and by their social and physical environment.

21.2 Theory: sensemaking and practice-based thinking

The first theory inspiring our study of assumptions is the theory of “sensemaking”, which addresses the question how people interpret a (seemingly) novel phenomenon in the light of existing routines and institutions. In his seminal work on *Sensemaking in Organizations*, Karl Weick (1995) identified seven key aspects of the sensemaking processes:

1. Identity: constructing who the "I" or "we" is.
2. Retrospective: looking back to make sense of what happened.
3. Enactive: people simultaneously interpreting and creating their world.
4. Social: it is never an individual achievement, but deeply social.
5. Ongoing: sensemaking never starts and never stops.
6. Extracting cues: people use 'cues', or points of reference, that enable sensemaking.
7. Plausibility over accuracy: plausible representations matter more than accurate ones.

Weick's starting point is that the social world does not simply manifest itself to people but is continuously constructed through labels and narratives. It is thus possible to find out how people make sense of the world by looking at how they talk about it, how they (collectively) act in it and how they respond to situations or encounters that do not immediately or apparently match their sensemaking. These ideas have informed our approach to tracing the role of underlying assumptions in the development and implementation of an educational initiative aimed at sustainable lifestyle changes.

Theories of social practices, our second conceptual basis, take people's "sayings and doings" (Schatzki, 1996) as the unit of analysis and look at how the material world, skills and competences, as well as meanings that people attach to them, shape and are shaped by practices. A practice can be simply defined as a cluster of behaviours, e.g. cooking, taking a shower, travelling to work, or taking care of others. Practices require and are dependent on systems of provision, such as transport infrastructures, policies or the power grid. Practices are generally rather stable entities, yet there are dynamic variations across space and time. Practice theorists have only recently shown an interest in changes and variation of practices (Backhaus, Wieser & Kemp, 2015), yet the theoretical tradition of considering their stability and spread is well developed (Gram-Hanssen, 2013; Shove, Pantzar, & Watson, 2012). It is precisely this strength of practice-based thinking which allows us to reflect on the effectiveness of the food initiative analysed here. Conceptual awareness of how deeply cooking and eating behaviours are entrenched in systems of provision, cultural norms, family traditions and personal habits triggers the question to what extent cooking sessions for primary school children can contribute to changing food consumption patterns.

21.3 Methods

The basis of our analysis is formed by an educational initiative that aims to teach children about more sustainable ways of living. We conducted interviews with people who developed and are implementing the initiative, and also performed ethnographic research into two implementation sessions. We also analysed the available information materials and an expert evaluation of the initiative. Data derived from these various sources are first scrutinised below according to Weick's key components of sensemaking. Subsequently, we critically evaluate assumptions emerging from this in the light of practice-based thinking.

21.4 The case study: a "food licence" for children

The Food Licence initiative forms part of the IN FORM programme, a national action plan of the former German Federal Ministry for Food, Agriculture and Consumer Protection (BMELV) to address malnutrition, lack of physical exercise, overweight, and related diseases. It was developed by the *aid-infodienst* (aid information service), a publicly funded institute involved in the dissemination of scientific evidence and practice-based knowledge related to agriculture, food, and nutrition. The Food Licence initiative targets primary school children and aims to teach them about a healthy diet, food preparation, hygiene, and table manners in six to seven practical sessions, including two playful assessments. The initiative offers an information kit for teachers as well as the option of hiring an expert to run the sessions. In addition, a booklet is provided to the children, with explanations, assignments and recipes.

Figure 21.1 Logo aid's Food Licence for children

By March 2013, after the initiative had been in place for six years, over 580,000 children had obtained a Food Licence. The large coverage of the initiative is partially due to financial support by the BMELV and expert support by the *LandFrauen Verband* (Countrywomen's Association).

An evaluation among 77 school classes across Germany found that the initiative has positive and lasting effects (tested after 6 months) with respect to knowledge, motivation, competencies, and behaviours. The evaluation also showed that children greatly enjoyed participating. Parents noted that after participation children were keener to help with grocery shopping and food preparation, and also paid more attention to food hygiene and table manners (Sommer, Ekert, & Otto, 2011).

21.5 Results and analysis

To trace the way assumptions influence thought and action we analysed interviews and participant observations with developers, implementers and participants of the Food Licence initiative. Sensemaking mechanisms obviously play a role for all actors involved and can hence be analysed from various perspectives. Our focus here is on those developing and implementing the change initiative, while to a lesser extent, we also reflect on participants' views. Key to the notion of sensemaking is an understanding of an individual's view in the context of an organisational setting. In other words, personal experience and expertise always play a role and are interpreted in the light of collective rules or procedures.

As proposed in Weick's framework, our findings show sensemaking as a deeply *social, continuous and enactive* process. In conversations with the developers and implementers of the Food Licence initiative, it became apparent how *particular cues* are used to justify collective actions. For example, increased numbers of overweight or obese children, bad dietary habits, diminishing knowledge about fruits and vegetables, kitchen know-how, and skills were frequently mentioned as reasons to construct and implement the initiative. Teachers' frustration about children arriving at school without breakfast or with lunch boxes filled with sweets were mentioned as motivators to participate in the Food Licence programme (B. Kaiser, personal communication, 11 September, 2013). One of the core assumptions underlying this initiative is therefore that information and skills training for children help tackle these problems. It is through this assumption that the initiative receives its general form and approach.

In line with Weick's framework, we also found that the extraction and interpretation of cues is governed by *plausibility rather than accuracy*. The idea to develop a "food licence" was born on the spur of the moment when one *aid-infodienst* employee thought of the "bike licence" that children obtain upon mastering certain cycling skills and traffic education. Following this initial conception, a programme consisting of several practical sessions and small, playful assessments was developed, also taking into account the experience that the *aid-infodienst* had already gained with similar programmes (Kaiser, personal communication, 11 September, 2013). The basic assumption at work here is that some practical training and assessments of cooking skills can teach skills and know-how that are necessary for a healthy diet.

As the spillover of ideas and assumptions from past initiatives into this initiative shows, positive implementation experiences can turn into cues supporting a chosen approach – or, to put it another way, experiences may confirm and reinforce particular assumptions. In addition, experiences gained during the implementation of the initiative, such as children enjoying the practical sessions and teachers' appreciation of expert involvement, as well as enthusiastic parental feedback, function as cues for its continuation in the current form. However, unlike what was predicted by experts, teachers preferred expert support during practical sessions even if they had already participated in numerous sessions, mainly because implementation runs much more smoothly when guided by an expert. A detailed evaluation of the programme attests to long-lasting effects in children, as was also reported by parents (Sommer, et al., 2011). The implementers of the initiative report that children who have been involved in the Food Licence programme and whom they meet again a few years later in the context of different (often also food-related) school programmes exhibit greater interest, commitment, and knowledge. In other words, there are personal and collective procedures to capture cues, make sense of them, and decide on plausible further or future strategies. Some cue-extracting procedures are formalised in evaluations and assessments, others are rather informal and personal. In either case, the results of these procedures appear to generally confirm the assumptions already held, and contribute to a stabilisation and continuation of the initiative in its original form. The only assumption currently being questioned by the experts who designed the programme based on implementation experiences and evaluations is whether it suffices to involve only children. The aid-infodienst now considers adding a session to the programme specifically targeting parents.

Figure 21.2 Pictures of two Food Licence sessions in Reichshof, Germany, 5 February 2014

Identity construction reveals itself as an interesting and complex process within this initiative. On the one hand, developers carefully constructed an "identity" for the initiative, including a recognisable logo and the "Cat Cook", a small animal that guides children through the practical sessions, offering additional tips and tricks. Teachers and experts who implement the Food Licence programme at schools have different ways of organising the sessions and communicating the information they would like children to remember. In other words, based on the way implementers view their roles and responsibilities, they imprint an additional identity layer on the programme. Finally, children participating have different ways of being engaged in the sessions, e.g. as the "expert chopper", "skilled peeler", "ingredient or equipment supplier" or "head chef", which means that each of them perceives their personal identity and the programme itself in a different manner. The sensemaking processes of identity construction by both experts and children relate to several assumptions about the effectiveness of the Food Licence programme. One such assumption is that experiencing oneself in a particular role as part of a team and collectively working towards a shared goal enhances learning. This assumption justifies the focus of the initiative on group assignments.

Our interview- and ethnography-based data also support Weick's assertion that sensemaking is always *retrospective*. For example, the current experiences of experts who facilitate classroom implementation refer back to previous experiences. Similarly, teachers and children make sense of their current lived experiences during the Food Licence sessions in relation to past experiences at home or during previous sessions. Initiative developers also construct sense and meaning for their actions in relation to past involvements, experiences and evaluations. People's retrospective reflections on current events allow them to make sense of what they are doing and, at the same time, appear to strengthen their assumptions about what is at stake and how to act.

We also found an element of *prospective* goal-setting or targeting that inspires the actions of people involved and that gives meaning to actions taken. For example, initiative developers assume that the programme they have developed helps to address general societal goals as well as session-specific target skills. Initiative implementers, in turn, assume that their actions help provide children with an enjoyable and informative experience, as well as keeping teachers as potential clients for future instances of implementation. Teachers assume that children will take their enthusiasm and experiences home and, at least to some extent, preserve them for the future. Either set of assumptions contributes to stabilising social relations and continuing collaboration towards particular goals (though the goals vary among actors).

21.6 Concluding remarks

Assumptions matter in the development, implementation, and outcome of initiatives addressing behavioural change. With the help of Karl Weick's framework of sensemaking, we traced assumptions in a particular project targeting food consumption behaviour, i.e. the German Food Licence initiative for children. Uncovering assumptions invites a critical questioning of their veracity.

The core assumption underlying the Food Licence initiative is that unhealthy and less sustainable food consumption habits largely depend on individual knowledge and skills. However, practice-based theories of human behaviour point to the interrelatedness of people's actions with other people's actions (e.g. parents), their embedding in available systems of provision (such as supermarkets) and their interaction with other practices (such as working, attending school, doing sports). Acknowledging this interdependency requires broadening the initiative to involve parents and address the way families organise their household and food routines.

Although initiative developers are considering involving parents, all they are currently envisaging is an additional informative session for this target group. These plans run counter to the core assumption that solely addressing children's kitchen skills falls short of achieving a shift in their food consumption. The evaluation of the initiative showed that it increases children's interest in fresh food (Sommer, Ekert, & Otto, 2011), and implementers also report that children readily connect with the topic (Engel, personal communication, 5 February 2014). The present preliminary study clearly shows that – irrespective of their veracity – assumptions matter because they inform and guide actions. Our findings show how assumptions based on personal beliefs, previous experiences, and (at times, strategic) evaluation find their way into the construction, implementation, and outcomes of an initiative targeting lifestyle changes.

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Chapter 22

Diversity of student perspectives on sustainable development as a feature of a competence-based learning environment

Astrid Offermans, Ron Cörvers and Joop de Kraker

Abstract

A key competence for sustainability professionals is the ability to deal with a diversity of perspectives in a productive way. To develop this competence in students, a diversity of perspectives on sustainable development should be part of their learning environment, which includes their fellow students. We investigated this diversity among the student population of the Masters programme on Sustainability Science and Policy (SSP). Diversity appeared to be limited, probably as a consequence of self-selection. We conclude that a conscious effort is required to introduce more diversity in students' perspectives on sustainable development in the SSP learning environment.

22.1 A key competence for sustainability professionals

Since September 2011, ICIS has been offering a 1-year Masters programme entitled Sustainability Science and Policy (SSP), which aims to deliver "sustainability professionals", i.e. academically trained professionals specialised in addressing sustainability challenges at the interface of science, policy, and society. Clearly, this aim requires that the graduates should have specific competences, which have to be developed in the Masters programme. A common approach to define these competences is to derive them from the typical nature of sustainability issues: complex, extending over multiple dimensions and scales, surrounded by uncertainty, normatively contested, and affecting a broad range of stakeholders as well as requiring their participation for an effective solution (see for example Wiek et al., 2011). This means that in addressing sustainability issues, SSP graduates will always have to collaborate with many other actors, who bring along a broad diversity of perspectives on the issue. A key competence will therefore be the ability to deal with this diversity of perspectives by interacting across the boundaries between different perspectives in a productive way. This ability has been termed "transboundary competence" (for a comprehensive discussion, see De Kraker et al., 2014). In terms of knowledge, skills, and attitudes, transboundary competence requires first and foremost an awareness of the diversity of perspectives and an understanding of the origins of this diversity. Skills include the ability to reflect on one's own perspective and to articulate it, to (temporarily) adopt someone else's perspective and to negotiate a shared perspective or frame of reference. The required attitudes towards other perspectives include acceptance of their legitimacy, willingness to engage, and belief in the added value of looking at a problem from different perspectives.

Competences are best developed in a learning environment that enables actual practice to be combined with explicit reflection on what and how to learn from that practice. An important characteristic of a learning environment fostering the development of transboundary competence would therefore be a heterogeneous student population (De Kraker et al., 2007). The idea is that diversity in disciplinary, national, and cultural backgrounds would translate into a diversity of perspectives on sustainable development. Discussion, dialogue, and collaboration with fellow-students would thus provide a continuous opportunity and need for "productive interaction across the boundaries between different perspectives." In this chapter, we investigate to what extent the high level of heterogeneity in the SSP student population results in a learning environment with the desired high level of diversity in terms of perspectives on sustainable development. First, we present some more details of the Masters programme on SSP and then we discuss our approach to measuring diversity in student perspectives and its results. We conclude the chapter with a brief reflection on these results.

22.2 Masters programme on Sustainability Science and Policy (SSP)

Aims

The aim of the SSP Masters programme is to train “sustainability professionals”, who have the competences to recognise, analyse, and respond to sustainability challenges; who can design, conduct, and evaluate sustainability assessments (for policymaking) in collaboration with other disciplines and stakeholders; and who are able to operate at the interface of science, policy, and society.

Courses

The SSP Masters programme is a 1-year programme (60 ECTS), taught entirely in English and consisting of four core courses that provide a scientific basis on sustainability and policy-making in the context of sustainable development. The courses are entitled “Fundamentals of Sustainable Development”, “Global Dynamics of Sustainable Development”, “Governance for Sustainable Development”, and “Sustainability, Law and the Environment”. After completing these courses, students focus on “Sustainability Assessment”. This means that they learn to design, conduct, and evaluate sustainability assessments for policy making in the pursuit of sustainable development through another three courses: “Knowledge Production for Sustainable Development”, “Methodology for Sustainability Assessment”, and “Sustainability Assessment Project”. The courses are complemented by skills training and the Master’s thesis. The skills training is very much hands-on and focuses on different methods considered essential in integrated sustainability assessment: modelling, participatory methods, scenario analysis, and multi-criteria analysis. In producing their Master’s thesis, students make use of knowledge, methods, and tools acquired during the SSP programme and apply these to a real-world sustainable development problem of their choice.

Students

Each year, 15 to 25 students enrol in the SSP Masters programme, with students from abroad significantly outnumbering Dutch students. Students come from Europe (Belgium, Czech Republic, Germany, Italy, the Netherlands, and the United Kingdom), Africa (Democratic Republic of Congo, Kenya, Nigeria, and South-Africa), Asia (China, Philippines, Sri Lanka, and South-Korea) and America (Brazil, Colombia, Peru, and USA). The students also differ widely in their disciplinary background (e.g. Arts Culture, Arts & Sciences, Biology, Business Administration, Communication, Engineering, Environmental Sciences, European Studies, Geography, International Studies, Organisation Studies, Political Sciences, Public Policy, Social Sciences, and Sociology).

Educational format

Problem Based Learning (PBL) has been at the core of all study programmes at Maastricht University since it was founded in 1974. The SSP Masters programme also embraces PBL, while one of its courses (Sustainability Assessment Project) is a form of project-based learning. PBL can be described as a "student-centred" approach: students mainly discuss the subject matter in small groups of 10-15 persons, tutored by staff, and only attend a few complementary lectures. The learning process is problem-driven, rather than theory-driven, and requires students to be active rather than passive.

22.3 SSP student perspectives on sustainable development

To answer the question how diverse the SSP students are in terms of their perspective on sustainable development, we have operationalised this concept using insights from Cultural Theory as a frame of reference.

Measuring perspectives

Cultural Theory (Douglas, 1970; Thompson et al., 1990) is an empirically validated typology that allows different perspectives to be distinguished on a wide range of topics (for an overview of topics to which Cultural Theory has been applied, see Offermans, 2012 page 18-19). It argues that each person may have a slightly different perspective, but our main assumptions of how the world functions can be reduced to four archetypical perspectives, or combinations of these archetypes. A *perspective* can be defined as an internally consistent perceptual screen through which people interpret the world and which guides them in acting (van Asselt, 2000). Cultural Theory distinguishes four perspectives: Hierarchism, Egalitarianism, Individualism, and Fatalism.

- *Hierarchists* generally approach unsustainable practices as a management problem; strict regulations, expert knowledge, and top-down approaches will guide people into a more sustainable direction. Nature is robust within limits, more insight into its complexity is needed to solve persistent sustainability problems, and sustainability science contributes objective information.
- *Egalitarians* approach unsustainability as a distribution and inequality issue; to solve these issues we need more transparent information and involvement of all stakeholders. Nature is very fragile and there is a strong need to adapt human demands to the limited availability of natural resources.
- *Individualists* see sustainability problems as an opportunity for progress. Industries play a potentially important role by producing more sustainable products that outcompete harmful products; this benefits the economy and the environment. Strategies that do well in the short term will also do well in the long term.

- *Fatalists* argue that sustainability is beyond our control and very much determined by natural processes like floods and droughts. Our destiny is beyond our own control, and long-term processes of large-scale transitions cannot be managed. Objectivity is a fairy-tale that does not exist in reality.

Table 22.1 operationalises these four archetypical perspectives by identifying different topics (column 1) underlying the concept of sustainable development, and presenting, for each topic, the typical view (belief) from each of the four perspectives. To measure someone's perspective, the person is asked to endorse the beliefs he or she agrees with. As real-life perspectives tend to consist of a mix of archetypical perspectives, zero, one, two, three or even four beliefs can be endorsed for each topic. Each endorsed belief equals a score of one. All endorsed beliefs together form a real-life perspective and yield a score for each archetypical perspective (vertical sum with every checked cell representing a score of one). We normalise this score to four and calculate x-, y-, and z-values that can be plotted in a standardized pyramid to indicate the position of a real-life perspective with respect to the four archetypes (see Figure 22.1) (for more information see Offermans (2012)).

Table 22.1 The Perspectives Map to measure perspectives on sustainable development. This table was used to measure SSP students' perspectives

	HIERARCHIST	EGALITARIAN	INDIVIDUALIST	FATALIST
Sustainable development as a concept implies	Stricter regulation and a connection of people, planet, and profit	Adapting demands and consumption, which will make us happier in the end	An opportunity for progress and advancement	A shift back in history and sacrificing present luxury (in wealthy countries)
Nature (Planet Earth)	Is robust within limits	Is very fragile	Is robust	Is dynamic and its robustness changes all the time
The current economic system	Is an integral part of sustainable development	Is a cause of/ threat to sustainability problems	Should be used better to promote and increase sustainable development	Can be seen as separate from sustainable development
Differences between the North and the South	Will remain as equality can never be achieved and would slow down action. Experts make sure the North also considers the interests of the South in decisions	Are caused by power inequalities, are hard to change, and a threat to sustainable development	Provide opportunities for both worlds and are therefore not necessarily bad (for sustainable development) The South has equal opportunities to compete in the market	Is a snapshot in time and may change in the next decades

	HIERARCHIST	EGALITARIAN	INDIVIDUALIST	FATALIST
Environmental quality	Does not have priority in the South, where the environment has to be damaged in order to allow people to survive	Is a prerequisite for sustaining livelihoods and development, especially in the South	Is a result of (economic) development	Depends on geographic and geomorphologic conditions, and can hardly be changed by human action
Use of technology	Before implementation, technologies should be properly investigated by experts. I have a moderate trust in technology	I do not really trust technologies, as we cannot anticipate the long-term consequences of its use. I prefer behavioural change	I greatly trust technology; we should use available technologies, invest in new technologies, and apply them on a large scale	Technologies can make our lives more comfortable, but results from the past do not offer any guarantees for the future
Long-term versus short-term	Due to accountability problems and lack of commitment, the main focus for SD has to be on the mid-term	Although there are pressing issues in the present, the focus for SD needs to be on the long term	Decisions that are good in the short run will also be good in the long run. The focus of SD can thus be on the short term	We are unable to regulate issues in the long term. A focus on increasing short-term benefits is therefore the only option we have
Responsibility for more sustainability	Governments are responsible for implementing measures and regulations that should be based upon research findings and Advice	All people have a responsibility to behave in a more sustainable way.	Companies have an important responsibility as they can create the demand for more sustainable products and they can choose to abandon unsustainable alternatives	You cannot hold anybody responsible: governments can only look 4 years ahead, individuals always want to optimise their own lifestyles (first) and companies have to make profits
Bottom-up versus top–down transition	We need top-down initiation for a transition towards sustainability	We need bottom-up initiation for a transition towards sustainability	It is not so much a transition we need, but new, sustainable products that outperform traditional ones	Transitions will come and go and are beyond the control of governments, companies or individuals
Incremental change	Will lead us step by step to a sustainable system. We need small steps to find a new balance, to have everybody on board and to preserve support	Is not enough to prevent disasters. We need a fast and profound change of the entire system	Is a sign of a less efficient form of change. In case of outperformance, change is usually bigger than incremental	Cannot be controlled. Any change is too external and too big to be controlled or induced. Systems change in an unpredictable way

	HIERARCHIST	EGALITARIAN	INDIVIDUALIST	FATALIST
People	Won't change voluntarily into a more sustainable direction. They have to be "forced" by means of regulations, subsidies, taxes etc., including punishment of bad behaviour	Will change into a more sustainable direction if they are provided with the right and complete information	Will change into a more sustainable direction if industries offer cheap and more sustainable solutions	Will never change into a new equilibrium; they will always shift between sustainable and unsustainable ways of behaving
Demand and supply	Every person has the right to satisfy their needs. Industries have to meet demands and if necessary increase their supply	Every person has the right to satisfy their needs. Industries have to share the available supply more effectively	Everybody has equal rights to satisfy their needs, but it is everybody's own responsibly to guarantee the fulfilment of needs	Neither demand nor supply can be determined or set at a fixed rate. We can therefore continue with what we are doing now
Solving sustainability problems	Requires more insight into the complexity of the problems	Requires more insight into inequality and involving marginalised countries/parts of the world	Requires more creativity and courage	Requires more patience and a bit of luck
Role of sustainability science	Formulating empirically tested guidelines and regulations that will lead to a more sustainable society	Involving all stakeholders in research, informing people and increasing the human capacity to learn and do better in the future	Making people enthusiastic about sustainable products, creating a demand for sustainable products	Valorisation of knowledge from different disciplines
Nature of objectivity	Sustainable development can be measured by experts who make use of detailed indicators. These experts are able to formulate guidelines for a more sustainable system	By involving different stakeholders, we can get a sense of the level of sustainability, but universal guidelines can never be established	Although ill-defined and difficult to measure, it is possible to formulate guidelines for a more sustainable system	Sustainable development cannot be measured; neither can guidelines be formulated
Subsidising sustainable alternative technologies	Is a good sign from the government and a first and doable step towards a more sustainable system	Less harmful is still not enough. We need brand new products with zero harmful impacts instead of adapting existing products	Is very cost-inefficient. Harmful technologies should not be prohibited or discouraged but outperformed by newly invented products	Is useless; the best we can do is try to prevent or minimise negative outcomes of current processes

	HIERARCHIST	EGALITARIAN	INDIVIDUALIST	FATALIST
Climate change	Is mainly anthropogenic and can be forecast relatively well, and its consequences can be controlled	Is purely anthropogenic, may be worse than predicted, and prevention is the only solution to prevent disasters	Is both anthropogenic and natural. We should not worry about the consequences as we will have enough time to adapt	Climate is changeable; it may follow trend A today and trend B tomorrow.
Biodiversity	Should be preserved; I consider it important that my grandchildren can also still enjoy a high level of biodiversity	Should be preserved because it has an intrinsic value	Is a bit over-valued: people and nature will also survive with less variety	Is over-valued. Fauna extinction took place long before human existence; it cannot be prevented and is not harmful
Food shortages	Result from a lack of rules, regulations, and control. It is a supply problem	Result from unequal power distributions; it is a distribution problem	Result from poor management and not following a truly liberal market approach	Result from coincidental events like droughts, hurricanes, or floods

Results

All SSP students of the 2nd-5th cohort (2012-2015) filled in a questionnaire (based on Table 22.1) at the start of their Masters programme (N=94). Figure 22.1 presents the results of this baseline questionnaire on student perspectives in the two triangles, indicating the degree of similarity of their perspectives to the four archetypes. It appears that the different cohorts were highly comparable in terms of their perspectives, and that the dispersion of student perspectives along the four axes was quite limited. Most SSP students seemed to have a mixed Egalitarian-Hierarchical perspective on sustainable development. Individualism and Fatalism were weakly represented among the SSP student population.

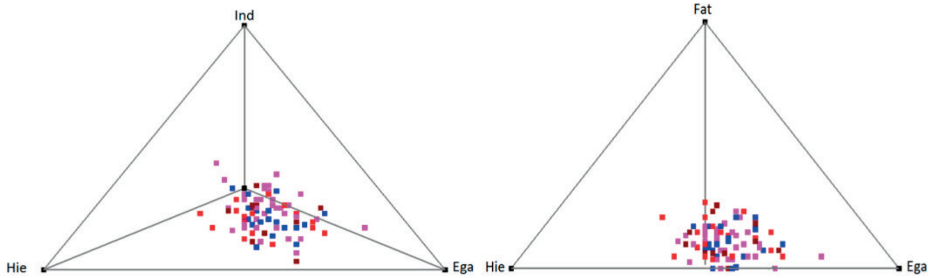

Figure 22.1 Student perspectives in comparison to the four archetypes: Hierarchism (Hier), Egalitarianism (Ega), Individualism (Ind) and Fatalism (Fat). The different colours of the dots represent the different cohorts (2012-2015).

22.4 Reflection

The diversity of perspectives on sustainable development in the SSP student population appears to be rather limited. Most students tend to have an Egalitarian-Hierarchical perspective. In hindsight, this may not be surprising, as the decision to apply for a Master's programme on sustainability and policy may be a self-selecting activity in terms of perspectives. Following Cultural Theory, we can expect Fatalists and Individualists to be less strongly attracted to topics concerning sustainability and assessments for policymaking. However, as professionals, the SSP graduates will inevitably have to collaborate with and do justice to people adopting Fatalistic and Individualistic perspectives. In order to prepare the students for this future, perspectives other than the Egalitarian-Hierarchist one that is dominant among the SSP students should be part of the SSP learning environment.

In addition to the perspectives of their peers, the students are also confronted with the perspectives of lecturers (including guest lecturers) and of clients and stakeholders in the Sustainability Assessment Project and Master's Thesis research project. We did not measure the diversity of perspectives on sustainable development in these groups, but we expect that the Individualistic and Fatalistic perspectives will be less represented here as well.

To stimulate the students' competence of dealing with different perspectives in a learning environment in which a diversity of perspectives is apparently not naturally present, we have to consciously introduce this diversity. Currently, the PBL sessions often challenge students to reflect upon sustainability issues from different normative positions. However, explicit recognition of, and reflection upon, different perspectives is as yet not embedded in the structure of the programme. The approach proposed by De Vries (2013) might be an effective didactic strategy. In his textbook *Sustainability Science*, the author introduces four archetypical perspectives and invites students to adopt and reflect on these different perspectives by providing a range of perspective-based statements on the major sustainability issues. Following De Vries, and throughout different courses, we could ask the SSP students to reflect upon sustainability issues from the different perspectives. Role plays may initially help the students perform this task, but after internalisation of the different perspectives, the competence to interact across the boundaries of different perspectives should become a natural part of a student's way of dealing with sustainability challenges.

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Part V
Sustainable development research at ICIS: methods of knowledge production

Chapter 23

Health in a borderless world: global health complexity

Maud Huynen and Pim Martens

Abstract

Globalisation affects health through extensive and complex linkages; the way different factors and developments interact is critical to how the system as a whole works. This chapter elaborates on the increasing recognition of systems approaches to global health. One of the first steps in applying a system-based approach to global health entails describing the system involved; here we present a conceptual framework for globalisation and population health. The involvement of interaction and feedback means that the system can be considered as a coherent network which acts as a determinant of global health. This challenges epidemiologists and health scientists to extend their conventional methodological boundaries. We argue that the research paradigms and methodologies applied in sustainability science can provide a promising way forward to address complex global health issues from a systems perspective. The chapter concludes with a brief discussion of possible barriers to adopting a sustainability science approach to health, in an effort to explain the slow progress made so far.

23.1 Introduction

Global health research addresses the ways in which globalisation is impacting on health determinants and health outcomes (Lee, 2003). In the past, globalisation has often been seen as a predominantly economic process characterised by increased deregulated trade, electronic communication and capital mobility. However, it is now increasingly perceived as a more comprehensive phenomenon shaped by a multitude of factors and events, which is rapidly reshaping our society. Based on the work by Scholte (2005), Held et al (2000), and Rennen and Martens (2003), we define globalisation as "a process characterised by a growing intensity, extensity and velocity of institutional, economic, socio-cultural and ecological interactions, resulting in trans-border processes and effects" (Huynen, 2008).

Since globalisation is not happening in a void, neither are its health risks. The dominant Newtonian scientific worldview – characterised by reductionist approaches – might no longer be sufficient. Globalisation affects health through extensive and complex linkages; the way different factors and developments interact is critical to how the whole system works. Global health cannot be disassembled into its constituent elements and then reassembled in order to develop an understanding of the system as a whole. Thus, by taking a traditional reductionist approach, we would miss the bigger picture. Nevertheless, reductionism remains the traditional and dominant epistemological approach in epidemiology[56]. This means that individual health determinants are studied, rather than the system of health determination as a whole; study designs focus on isolating cause–effect relationships, rather than exploring system interactions.

Stressing the need for a system-based approach to global health, this chapter first briefly elaborates on the increasing recognition of the complexity of global health, and subsequently discusses a conceptual model describing multi-causality within the global health system. Accordingly, we argue that research (and policy) in the field of global health requires a systems approach, building on insights and methodologies from sustainability science. The chapter concludes with a brief discussion of possible barriers hampering the adoption of a sustainability science approach to health, in an effort to explain the slow progress made so far.

23.2 The complexity of global health

The recognition that many issues should be studied as a whole has played an important role in the development of complexity theory. Complex systems encompass many

[56] Epidemiology is the study of the distribution and determinants of health-related states or events (including disease), and the application of this study to the control of diseases and other health problems. (http://www.who.int/topics/epidemiology/en/).

entities interacting with each other, and the variety of these interactions allows the system as a whole to undergo self-organisation. As a result, complex systems have the ability to adapt and co-evolve as they organise through time; they are characterised by emergent system properties, non-determinism, non-linearity, feedback loops, and bifurcation points (Pearce & Merletti, 2006; Waldrop, 1992). Table 1 provides an overview of the most important differences between the (traditional) Newtonian and complexity paradigms. Following its growing influence in the natural sciences, complexity theory has "begun to spill onto the edges of the social sciences as well" (Urry, 2005b), and various scientists studying the processes of globalisation – often implicitly – draw upon concepts and ideas from the field of complexity theory (see e.g., Knorr Cetina (2005), Urry (2003, 2005a), and Castells (1996)).

In line with this development, the past decade has witnessed a growing recognition of the multidimensional and multilevel causation of population health. An ever growing number of health researchers (Albrecht et al., 1998; Colwell, 2004; Huynen, 2008; Huynen et al., 2005; Lang, 2012; McMichael, 2005; Pearce & Merletti, 2006; Wilcox & Colwell, 2005) argue that the health of a population can – or must – be viewed within the broader system of health determinants. Risk factors for disease do not operate in isolation, but occur in a particular population context (Pearce & Merletti, 2006). Upstream or contextual forces play an important role in global health research (Sreenivasan & Benatar, 2006) and may have large impacts, although their effects are non-linear and less predictable (Philippe & Mansi, 1998). As our attention moves upstream in the causal chain of health determinants, there has been an increasing interest in multilevel and systems approaches (McMichael, 1995, 1999; Pearce, 2004; Pearce & Merletti, 2006). Various terms have been used to describe this broader approach to our health, such as eco-epidemiology (Ladd & Soskolne, 2008; Martens, 1998; Soskolne & Broemling, 2002; Susser & Susser, 1996), ecological perspective on health (McLaren & Hawe, 2005), socio-ecological systems perspective on health (McMichael, 1999), ecosystem approach to public health (Arya et al., 2009), ecological public health (Lang, 2012; Morris, 2010) and biocomplexity approach to health (Colwell, 2004; Wilcox & Colwell, 2005). As Soskolne et al. (2007) stated, we "must embrace greater complexity" as "the traditionally used, reductionist, linear approaches are inferior for understanding the interactive webs that are critical for sustainable development and for the health and well-being of future generations." Similarly, the WHO (2009) argues that systems thinking works to reveal the underlying characteristics and relationships of systems.

Few would deny that globalisation has greatly added to the causal complexity in public health (Morris, 2010) and insights from system-based or complexity approaches have also been increasingly recognised in the field of global health (Huynen, 2008; Huynen et al., 2005; Martens et al., 2011; Soskolne et al., 2007) (see also Table 23.1). As a result, the acknowledged complexity of synergistic global interconnections calls for systems approaches to global health (WHO, 2011).

Table 23.1 Different perspectives on science: the Newtonian paradigm versus the complexity paradigm (Huynen, 2008).

Newtonian paradigm	Complexity paradigm	Implications of complexity in global health
Reductionism: Developing an understanding of a system's constituent parts (and their interactions) is the best way to develop an understanding of the system as a whole.	Holism/contextuality: Complex systems should be studied as a whole; they can have emergent properties that are not explainable from the sum of their (reductionist) parts.	The processes of globalisation and population health are modified by multiple factors, which cannot be studied in isolation from each other. Global health impacts depend on the interplay between many developments, which together form the broader context of population health. Hence, the underlying processes interact at various scales; they are often not fully understood and they might behave in non-linear and unpredictable ways. As a result, system-based or complexity approaches are needed.
Systems respond in a predictable way according to universal laws.	Systems respond in unpredictable ways.	
Linearity: A direct and proportional connection can be established between each cause and effect.	Non-linearity: A small perturbation may cause a large effect. This is often called the "butterfly effect" (see also chaos theory). Tipping points may be reached when the system passes a particular threshold.	
Systems tend towards equilibrium and are driven by negative feedback.	Systems are inherently unstable and positive feedback-driven processes are common.	
Non-historical (time-reversible).	Path-dependence (time-irreversible): complex systems are dynamical systems – they change over time, and prior states may influence present states.	
Uncertainty is a symptom of bad science and needs to be reduced.	Uncertainty is inherent to complex systems and needs to be acknowledged.	Any exploration of health effects of globalisation is surrounded by uncertainty. This uncertainty leads to the introduction of normativity and plurality. As a result, normative choices and transdisciplinary approaches are needed.
Deterministic, one possible future.	Non-deterministic/stochastic, multiple futures are possible.	

23.3 Taking a systems approach: a conceptual framework for globalisation and health

One of the first steps in applying a system-based approach to global health entails trying to describe the system involved. This effort should indicate the importance of studying proximal causes in their broader context. In order to further illustrate this broader context of global health, Figure 23.1 presents the conceptual framework for globalisation and population health developed by Huynen et al. (2005). This framework combines the nature of health determinants and their level of causality into a basic framework that conceptualises the multi-causality of population health.

In order to differentiate between different types of determinants, the customary distinction is made between institutional, socio-cultural, economic, and environmental determinants. These determinants operate at different hierarchical levels of causality. The chain of events leading to a specific health outcome includes both proximal and distal causes: proximal factors act directly to cause disease or health gains, while distal determinants are positioned further back in the causal chain and act via intermediate causes. In addition, contextual determinants play an important role. These can be seen as the upstream macro-level conditions shaping the distal and proximate health determinants; they form the context within which the distal and proximate factors operate and develop. Within this framework, the processes of globalisation (including global environmental changes) operate at the contextual level of health determination, influencing distal health determinants. In turn, the changes in distal factors have the potential to affect the proximal determinants and, subsequently, health. Determinants with different positions in the causal chain probably also differ in their temporal dimensions. Individual-level proximal health risks can be altered relatively quickly, for example by a change in personal behaviour; changing disease rates in whole populations requires slower and more permanent changes in contextual factors, often over the course of a few decades (Huynen, 2008).

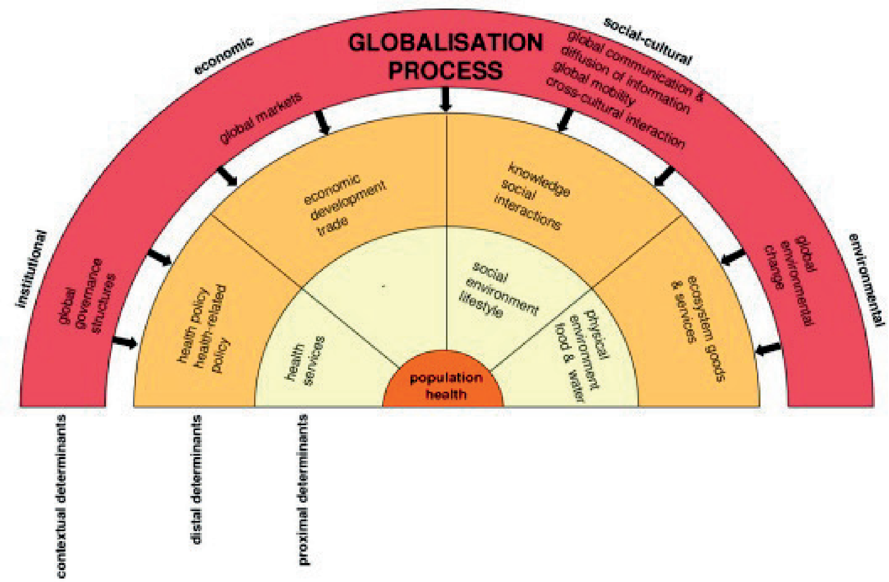

Figure 23.1 The health impacts of globalisation: a conceptual framework (Huynen, 2008; Huynen et al., 2005).

The involvement of interaction and feedback means that the whole can be considered as a coherent network which acts as a determinant of global health; the outcomes of these interactions will vary across geographical locations, but also across different disease outcomes.

23.4 Sustainability science for global health

Although problem framing in order to comprehend all relevant variables within the global health system is an important step forward, it might represent only the tip of the iceberg. Within this system there are dynamic processes and feedback loops, resulting in emergent system properties (i.e. the whole is greater than the sum of its parts), points of bifurcation and possible tipping points. There is little doubt that a system-based approach and related methodologies are needed to underpin research into global health. This challenges health scientists, as well as scientists and practitioners in other disciplines, to extend their conventional methodological boundaries. To date, however, a huge gap is apparent between paradigm and practice. Yet, innovative methods and tools are emerging in other fields, providing examples of what is available and conceivable to advance further systems research exploring future health in order to support decision-making processes (Soskolne et al., 2009).

We argue that the research paradigms and methodologies applied in sustainability science (Kates, 2011; Kates et al., 2001; Kerkhoff, 2014; Martens, 2006; Miller, 2013; National Recource Council, 1999) can provide a promising way forward to address complex health issues from a systems perspective. Over the last decade, sustainability science has emerged as an interdisciplinary and innovative research field conducting problem-driven and problem-solving research that links knowledge to action. Central concepts in sustainability science are systems thinking, complexity, and uncertainty. As a problem- and solution-oriented field, sustainability science is inspired, inter alia, by concepts of Mode-2 science (Gibbons et al., 1994) and post-normal science (Funtowicz & Ravetz, 1993, 1994; Ravetz, 1999). This also requires corresponding research practices, such as transdisciplinary approaches (Lang et al., 2012) and the co-production of knowledge (Kerkhoff, 2014). Hence, a sustainability science approach to global health should account for a number of shared research principles such as transdisciplinarity, participation of non-scientist stakeholders, co-production of knowledge, recognition of uncertainty and system complexity, and the quest for an exploratory science instead of a predictive one.

Box 23.1 Sustainability science for health research: the state of affairs

Scenario analysis of future health: A system-based approach implies less emphasis on prediction, but simultaneously a greater emphasis on understanding the processes involved, acknowledging (inherent) uncertainties, and exploring alternative health futures. In sustainability science, scenarios analysis is used as a tool to assist in the understanding of possible future developments of complex systems, focussing on the interaction between multiple factors according to a set of internally consistent future pathways. Scenarios can be described as plausible but simplified descriptions of how the future may develop, according to a coherent and internally consistent set of assumptions about key driving forces and relationships (Swart et al., 2004). Looking at the main global-scale scenario studies, it can be concluded, however, that the health dimension is largely missing (Huynen, 2008; Martens & Huynen, 2003). Many of the emerging foresight studies and initiatives in health mainly focus on health systems and health care (e.g. European Health Futures Forum).

Modelling the health system: In modelling population health, traditional epidemiological approaches mostly use regression techniques to explore the relations between health determinants and health outcomes (Galea et al., 2010; Soskolne et al., 2009). However, these usually provide only limited insight into the dynamics underlying changing health patterns; a fundamental limitation remains in addressing interacting relationships within the system (Galea et al., 2010). Hence, there is growing interest in adopting innovative model approaches in health research that allow for causal influence at multiple levels, as well as interactions among system variables, feedbacks, and non-linearity (Galea et al., 2010; Mendez, 2010; Sterman, 2006; Trochim et al., 2006). Moreover, health scientists can learn from other fields that have been applying such simulation approaches, such as systems biology, ecology and environmental sciences, and organisational science (Galea et al., 2010).

Transdisciplinary/participatory methods: The use of transdisciplinary/participatory methods is more exclusively linked to the emerging paradigm of post-normal science. The omnipresence of uncertainty in complex systems allows for different valid views on the essence and functioning of these systems, introducing plurality and normativity. As a result, the involvement of an “extended peer community” is considered a superior form of knowledge production and quality control. Hence, the involvement of actors from outside academia in the research process is also seen as a key component of sustainability science; it facilitates the integration of the best available knowledge and co-production of knowledge, the identification and reconciliation of values and preferences, as well as creating ownership of problems and solutions. Although transdisciplinary, community-based, interactive, or participatory approaches have been suggested in order to meet these goals (Lang et al., 2012), transdisciplinary approaches are not yet commonly applied to address complex public health challenges (Haire-Joshu & McBride, 2013).

Box 23.1 provides examples of common sustainability science methods that could be applied to global health in order to advance further research (Soskolne et al., 2009). However, it is important to note that the selection of a specific method and its application to a specific topic or case study are highly dependent on the context of the assessment. Additionally, an integrated assessment is best supported by a combination of tools (see e.g., Valkering (2006) and van Asselt (2001)). For example, participatory processes can contribute to model building by revealing different perspectives on model structure or key components, and to scenario development by revealing different perspectives on vital uncertainties and possible futures. Scenarios can be used as input for simulation models in the face of uncertainty and as input for participatory processes. Finally, simulation models can be used as input for participatory processes and can provide input or validity checks for scenarios by, for example, defining realistic ranges for key aspects of scenarios.

23.5 The need to overcome barriers

Thus, there is a need to broaden the traditional reductionist view on disease causation in order to account for a multilevel understanding of disease aetiology and the interrelations among these multiple health determinants (Galea et al., 2010). Linear, reductionist approaches to research questions – focusing on proximate cause-and-effect relationships – have characterised much of what epidemiology has contributed to public health in the second half of the 20th century (Soskolne et al., 2009). As a result, however, the exploration of long-term and complex risks to human health seems far removed from the tidy examples that abound in textbooks of epidemiology and public health research. System thinking and sustainability science challenge the epidemiological concern with studying single causes of disease in isolation; due to their training, epidemiologists and public health researchers are less accustomed to studying causes within a systems context or addressing far longer time frames than the current boundaries used in the health sciences and the formal health sector (Martens & Huynen, 2003).

A sustainability science approach to global health also implies recognising that there is no single discipline or single operational method for systems thinking (Leishow & Milstein, 2006). Such interdisciplinarity requires health researchers to be particular open to and learn from the contributions of other traditions and approaches. Moving even beyond research collaborations among and across disciplinary boundaries, transdisciplinarity requires the involvement of, and collaborations with, non-academic stakeholders from business, policymaking and/or civil society. However, scientists taking a more conventional research perspective, such as traditionally trained epidemiologists and health researchers, might question the reliability, validity, and other epistemological and methodological aspects of this type of research (Lang et al., 2012).

From a more practical perspective, transdisciplinary research is a relatively new field, still in need of further development in order to overcome its teething problems. Lang et al. (2012) recently published a very elaborate overview of the main challenges (and possible coping strategies) in conducting transdisciplinary research, including difficulties concerning design principles (e.g., lack of joint problem framing, selection of stakeholders/team members), methodological issues (e.g., conflicting methodological standards, discontinuous participation), and problems in the application of co-created knowledge (e.g., lack of transferability of results). They conclude that further development of the practice of transdisciplinary research requires "continuous structural changes in the academic system in order to build capacity for transdisciplinarity among students and researchers". The identified (practical) research challenges, as well as their conclusions about the need for capacity building, seem equally valid as regards conducting transdisciplinary research in the field of health and sustainable development.

Furthermore, the use of complex systems dynamic modelling approaches demands a shift from singling out a single cause as the main research objective to a focus on understanding interactions and interrelations between various causal factors operating at multiple levels, in order to examine how these relationships (and feedbacks) contribute to the emergence of disease patterns within a population (Galea et al., 2010). These models need to be parameterised with observational (epidemiological) data, but this data needs to be applied in a creative way, combining information from disparate sources and allowing for assumptions to be made in order to create simulation models in the face of imperfect data and uncertainty about parameter values, relationships, and future developments. Accounting for a system's complexity and uncertainty will also require a conceptual shift for epidemiology and public health – from statistical association models focused on observed effect estimates to simulations of complex dynamic systems of health determination in which we test scenarios under different conditions (Galea et al., 2010). Thinking critically about "what-if scenarios" entails moving from a predictive science trying to eliminate uncertainty to an exploratory science faced with (inherent) uncertainties.

Hence, as emphasised by Galea et al. (2010), lack of familiarity with methods and limited training in their implementation are probably enough reasons to delay epidemiologists' adoption of system-based approaches. But despite the fact that health scientists might feel comfortable with more reductionist approaches and are consequently slow adopters of systems thinking, we have to face the reality that what is at stake here are complex real-life health risks that need to be understood and addressed in the face of many system interactions within the global health system. However, we emphasise that global health researchers do not have to start from scratch; by building on the expertise already available within the sustainability science community, they might even become pioneers in further applying such a (complex) systems approach to health-related issues.

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Chapter 24

Working institutions from the inside out: action research for transformations towards sustainability

Alex Baker-Shelley

Abstract

Considering the recent resurgence of debate surrounding the role of the university in the 21st century, and the complexity of interconnected sustainability challenges we face as a species, more reflexive and embedded research methods are required. In the context of analysing transformations towards sustainability at universities, I discuss the example of action research at Maastricht University to exemplify the utility of participation and the social impact of organisational research. There is a systemic relationship and interconnectedness that exists within the university and its surroundings. Appropriate research methods must follow suit by disentangling these associations in insider-academic research of the system in question, clarifying the dynamic role science must now play in society towards greater socio-ecological wellbeing. Challenges present in this kind of embedded research range from being privy to information (whether tacit or explicit), pre-understanding, role duality, and managing organisational politics associated with perceived implications of one's research to its stakeholders.

24.1 Why universities need to become more sustainable

> *A sustainable university is "A higher educational institution, as a whole or as a part, that addresses, involves, and promotes, on a regional or global level, the minimisation of negative environmental, economic, societal, and health effects generated in the use of their resources in order to fulfil its functions of teaching, research, outreach and partnership, and stewardship in ways to help society make the transition to sustainable life-styles" Velazquez et al. (2006)*

Universities have been lagging behind other sectors in terms of embedding sustainability into their organisational structures (Lozano, 2011). Much research has been undertaken into the "what" of organisational transformation, corporate responsibility, sustainability reporting and accounting, (Aras and Crowther, 2008, Aras and Crowther, 2009, Clark and Master, 2012, Eccles et al., 2012, Lozano, 2006, Zadek, 2006), yet relatively little has been performed on the "how" (Shelley, 2013), and less still for a specific integration of sustainability into the core business of higher education institutions (HEIs). Progress towards embedding sustainability across departments, faculties, facilities, and operations at HEIs has been slower than expected and there is a definite lack or "clear orientation on exactly what a sustainable university should be" (Velazquez et al., 2005).

Considering their unique position and legacy in society, as well as their significant capacity for innovation and the honest brokerage of knowledge at the boundaries of science, policy, and politics (Pielke Jr., 2007), it is notable that their potential has remained largely untapped. It is still nonetheless encouraging to see headway being made post Rio+20, especially with the Higher Education Sustainability Initiative (HESI) commitments playing an enabling role in mobilising HEIs to ensure a sustainable future (Simon and Haertle, 2014). Another positive trend is the rate of uptake of sustainability standards, social impact measures, and corporate social responsibility (CSR) communications strategies by businesses and universities, as well as partnerships and collaborations with NGOs and civil society over the last decade. This has done much to change the landscape of superficial and reactionary policy for sustainable development towards a deeper recognition to make it part of organisational DNA (KPMG, 2013, Hespenheide and Koehler, 2012, Gray and Stites, 2013).

This plays against the backdrop of a series of charters and declarations signed by global networks of HEIs to cement their commitment to the global transition towards a more sustainable society, such as the Talloires Declaration (1990), the Copernicus Charter (1994), the Handvest Duurzaamheid HBO1 (1999), Agenda 21 (1992), and the most recent UN Decade for Education for Sustainable Development (2005–2014) (Boer, 2013). If there was no problem of sustainability at universities then why would a whole decade have been dedicated explicitly to achieving it? HEIs need to become more sustainable yet they claim to find it difficult to meet their social and environmental responsibilities. Many institutional barriers exist, such as decentralisation, a lack of environmental literacy, and lack of democratic principles. The boundaries between public and private have become increasingly blurred; managerialism logics have predominated over bureaucratic ones leading to a "marketisation" of HE (Howells et al., 2014, Natale and Doran, 2012). This shift in ideology experienced in the last couple of decades is unprecedented in the history of universities, and certain managerial standards have swiftly become the norm, further complicating matters. Universities must nevertheless justify how they contribute to solve ecological, social, and economic challenges of unsustainability with the knowledge that they produce and implement in research and education. Such challenges and external drivers are represented in the conceptual map of institutional governance for sustainability shown in Figure 24.1.

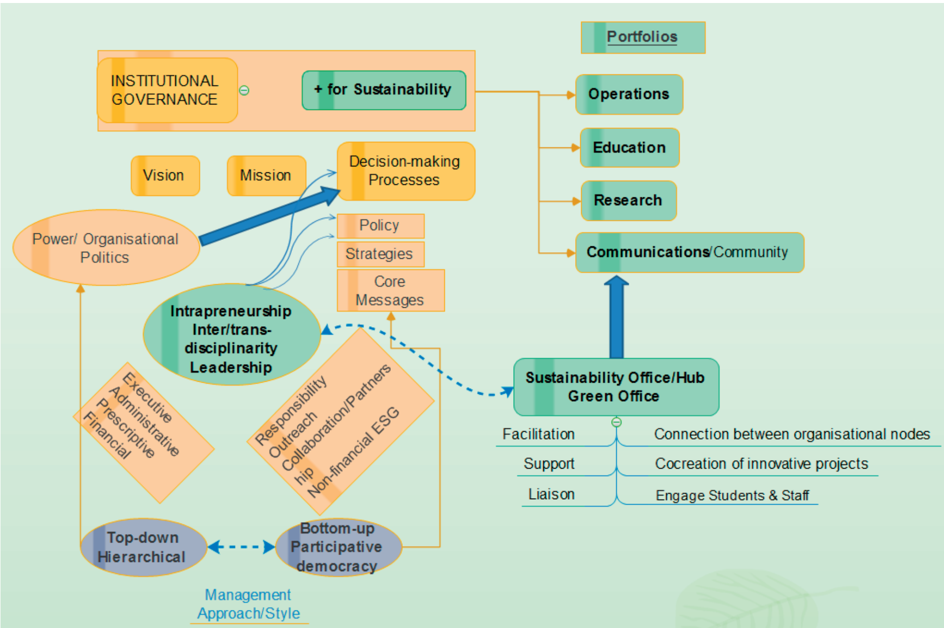

Figure 24.1 A concept map of internal institutional governance for sustainability

However, the dynamics of how this process of transformation takes place are not yet well understood (Hoover and Harder, 2014), which calls for greater focus on such processes that embed sustainability at HEIs (Stephens and Graham, 2010) and recommendations that they must be promoted in policy that targets a shift in the behaviour of the citizens of the institution (Velazquez et al., 2006). According to Yarime et al (2012), this means taking into account the deep structure and inter-personality of a university, all its sub-systems, facilities, and departments, including their interdependencies, in a systemic and dynamic understanding.

This represents an emerging paradigm in institutional governance that goes beyond the traditional "third mission" (Trencher et al., 2013) of an entrepreneurial, knowledge-producing, and technology-innovating institution; however it is unclear exactly what form this will take since “the wheel is still in spin” and paradigmatic changes in and of science change as a result of external perturbation and crisis (Kuhn, 1996). Accordingly, co-production and design of solutions and societal transformations will grow as global trends, complemented by the launch of the Future Earth initiative, the expected renewal of the UNDP’s Millennium Development Goals after 2015 into Sustainable Development Goals at upcoming international conferences in Paris, and the growth of sustainability science as a discipline and profession in its own right (Trencher et al., 2014).

24.2 Sustainability transformation of HEIs

Taking the background of macro-societal drivers that the University of the 21st century is tasked with in Figure 24.2, I argue that a sustainability transformation of the HEI is needed towards a more desirable and resilient end state. This systemic transformation required of and by universities is here conceptualised as a change in the very nature of a system (the university) from one state to another; a shift in the equilibrium of the means, methods, and processes by which the subject, whether individual, faculty, organisation, institution, or region, functions. This adds components of societal wellbeing, effective management of socio-ecological systems and resilience to such a system – or as some have proposed “a public university aimed at the common good” (Halffman and Radder, 2015) – and gives it equifinality: a choice in the manner of arriving at a destined state of higher sustainability that is not absolute but guiding; in other words there are multiple paths but no absolute sustainability. The end state of a “sustainable university” should be context-based and developed according to the organisational culture, values, strategy, and structure. This holds true if the system is open in that it has an inextricable environmental relationship with its surroundings, in addition to it having a developmental growth pattern.

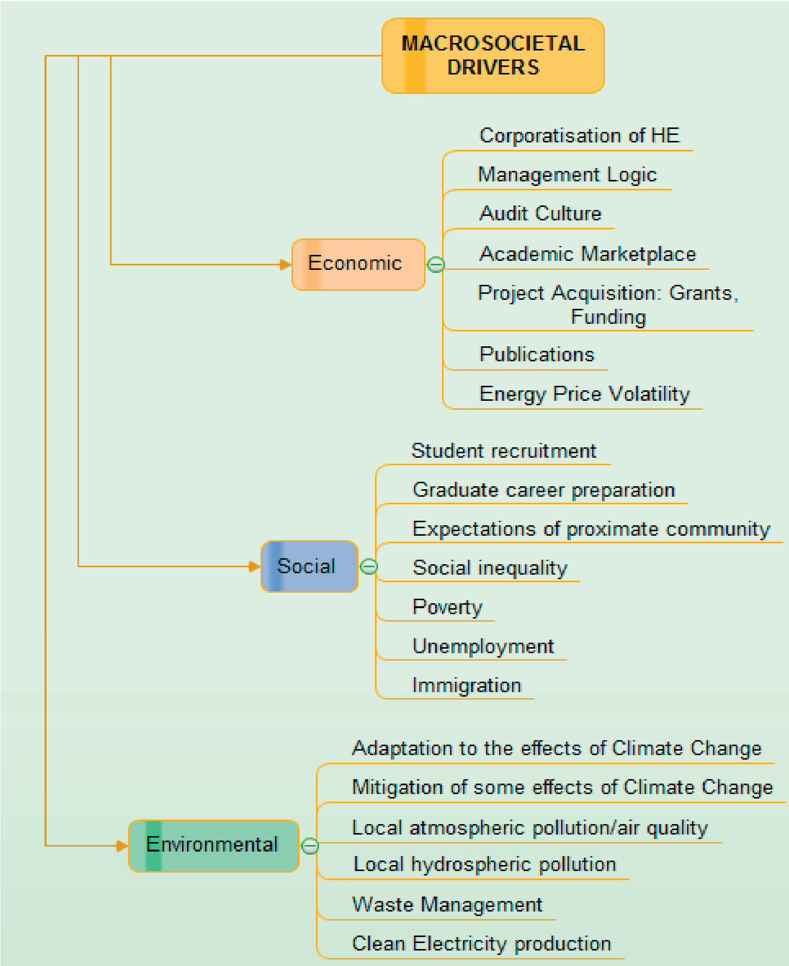

Figure 24.2 Macro-societal drivers of change at HEIs

24.3 Nitty-gritty: why this organisational research demands social impact

Considering the systemic relationship and interconnectedness that exists within the university and its surroundings, appropriate research methods must follow suit. Sarewitz and Pielke (2007) argue that it is rarely considered in science-policy discourse or decision processes that “alternative research portfolios might better achieve stipulated societal outcomes”. The supply and demand of science clarifies the dynamic role of science in society by ideally matching the needs of end-users of scientific knowledge produced (Sarewitz and Pielke, 2007). My research project is geared towards having a positive societal outcome in the form of policy recommendations for Maastricht University (UM) on its management of sustainability, based on a four-year scientific investigation. Advice will be based on the results of case studies of pioneering institutions as to how to transform UM structurally into a sustainable institution.

This research can essentially be boiled down to providing and brokering scientific knowledge so that university management and 'Green Offices' (student-driven, staff-supported sustainability departments: http://greenofficemaastricht.nl/) have a balanced account of how to gear up their institutes as trans-sectoral actors and facilitators of transformational change in the 21st century. This bolsters the usual indicators of successful performance of HEIs (student numbers, research project acquisitions, rankings etc.) as well as emphasising governance for sustainable development and corporate responsibility. It operates at the science–policy interface, defined by van den Hove (2007) as a social process that encompasses "relations between scientists [students, practitioners and decision makers] in the policy process.." allowing "for exchanges, co-evolution, and the joint construction of knowledge", enhancing social impact.

The ideal goal of all this is social and organisational learning: a change in understanding occurring in the individuals populating and influencing the university's transformation – stakeholders, co-researchers, policy makers and management – at the surface and at a deeper level "demonstrated by a change in attitudes, world-views or epistemological beliefs" (Reed et al., 2010) towards a sustainable development of and by their institute in its urban, regional, and international settings. Central to this aim at UM are just such a group of individuals, the Green Office, whose mandate is to manage the sustainability portfolio of UM in the areas of research, education, operations, and community engagement. This project also looks at how it is fulfilling its role towards the overall sustainability transformation of this university. This fundamentally requires a level of embeddedness by the researcher as an "insider" that goes beyond conventional case-study research.

24.4 'Insider' action research

> "Action research is a period of inquiry, which describes, interprets and explains social situations while executing a change intervention aimed at improvement and involvement. It is problem-focused, context-specific and future-oriented." (Waterman et al., 2001)

In order to understand the nature of complex systems, we must dismantle them into units to examine the underlying complex relationships and mechanisms internal to the case under study (Wallerstein (1974) in Moses and Knutsen (2012)). We have to untangle the complex knot of interactions, with the focus on the internal causal mechanisms from which an organisational transformation takes hold and propagates.

To understand the hermeneutic tradition of organisational research is to see the researcher going in, or entering the site with a clean slate; that is, few or no theoretical preconceptions. This is a target which, although it can never be attained, allows the subject's (a university sustainability department for example) empirical evidence to guide the emergence of key themes and concepts (Brannick and Coghlan, 2007). Taking the decision to actively involve stakeholders in research is a necessity given the action research approach (see Figure 24.3), which builds on the philosophical tradition of Pragmatism; the notion that knowledge (whether obtaining it or sharing it) is based on observing the consequences of intentional action. It is inherently participatory, following a democratic approach to knowledge production, with the researcher being actively involved in intentional change to increase the chances of social and organisational learning taking place at UM.

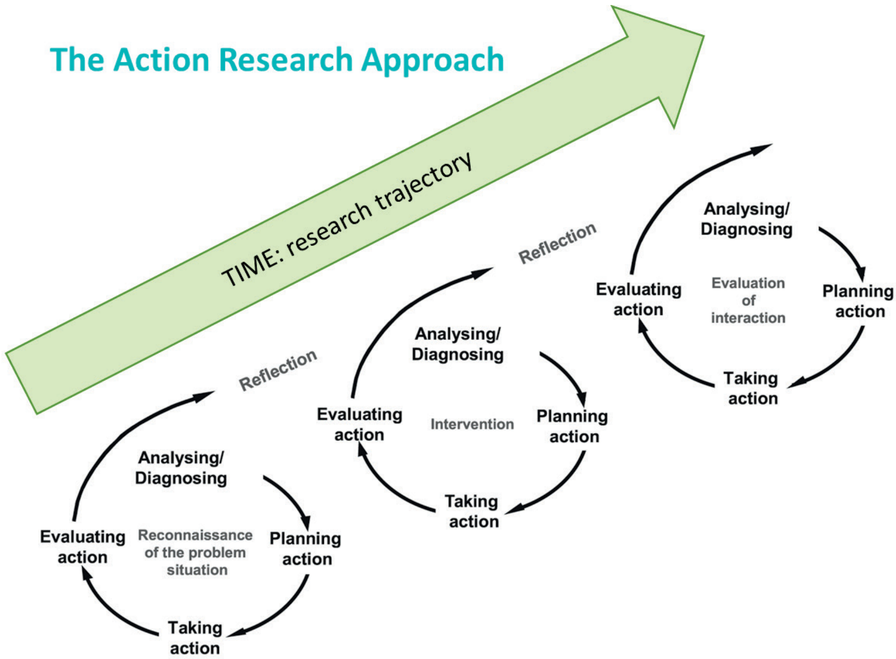

Figure 24.3 The action research process, adapted from Coghlan and Brannick (2014)

It aims to facilitate social learning and the development of novel, scientifically sound yet practicable knowledge by involving relevant stakeholders, including the researcher, in multiple cycles of planning, action, observation, and reflection (see Waterman et al. (2001)). The objective is to be aware of where the researcher places him/herself on the spectrum between the "objective" observer and the active team member; balancing the role between acting as a “critical insider or friendly outsider” or vice-versa. Or more technically, as Brannick and Coghlan (2007) put it, action research is one of three major research paradigms where one can do “insider research”, defined as “research by members of organisational systems in and on their own organizations”. Progress is made after several cycles in terms of awareness and implementation of sustainability strategies and responsible internal leadership.

It is ultimately both an essential opportunity and a risk in any research that requires an inside-out perspective, where you as the researcher are deeply embedded in the organisation that is both paying you and that you are required to investigate. Challenges inevitably arise from access, pre-understanding, role duality, and managing organisational politics (Brannick and Coghlan, 2007). The last aspect is considered of particular relevance for any study approaching the often thorny issue of integrating sustainability into an organisation. It does not therefore take too much of a leap to imagine that there is a political context in which projects such as this operate (Brannick and Coghlan, 2007, Hoover and Harder, 2014). It is also thus logical to assume that the institutional context becomes an essential part of the appraisal process and can significantly affect the success of the organisational-level shift that aims to better contribute to sustainable development at multiple levels of society and the ecosystems it depends on.

In essence, universities educate and prepare future leaders, whether politicians, NGO leaders, social entrepreneurs, or those who will be concerned with regulating and monitoring the international business community, with respect to the complex challenges of the 21st century. In response to worsening crises of climate and capitalism alike, they also have a moral obligation to provide, through education and research, the societal transformation required of current modes of production and consumption based on economies that do not currently respect ecological limits. The way public institutions are managed has been changing at an unprecedented rate. Accordingly, researchers ought to adapt their methods to go above and beyond the convention in order to meet increasing societal demands to breach the walls of the ivory tower, enhancing the role of the university in cross-sectoral governance for sustainable development. This article has aimed to explain one way of doing this in the context of UM’s sustainability portfolio.

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Chapter 25

The Perspectives Method: towards socially robust river management

Astrid Offermans

Abstract

People have different ideas about the best ways to manage water. These differences are usually not rooted in a lack of knowledge, but in having different perspectives, which tend to be implicit and difficult to unravel or directly reflect upon. In this chapter I present the so-called Perspectives Method – based on Cultural Theory – that allows changing and non-stereotypical perspectives on water to be operationalised, assessed, and monitored. After an introduction and brief explanation of the method, I show that the method may be used for different purposes; to stimulate dialogue, to analyse the past in order to learn more about perspective change and its effects on support for measures, and to explore present and future support for policies.

25.1 Introduction

The Dutch are well-known for their struggle against the water, especially after their country was struck by a disastrous flood in 1953, inundating 165,000 hectares of land and resulting in 1830 fatalities. Moreover, 100,000 people lost their homes and the economic damage to buildings, livestock, and infrastructure was huge. The large-scale innovative Delta-works were implemented in response to this disaster and helped the Dutch defeat their enemy, the water. In recent decades, however, there has been increased attention for more natural ways to control river discharges by intentionally providing more space for environmental processes and water. In less than five decades, the relation between the Dutch and the water shifted from fighting an enemy towards living with a friend. This paradigm shift has resulted in decreased support for traditional, control-focused measures like dike reinforcements and an increasing demand for nature-oriented measures like the "Room for the River" programme and the restoration of natural river banks and the winter bed.

The current Dutch river management approach can best be described as a mosaic: dikes covered with grass or asphalt, of different heights and widths, alternate with "room for the river" areas, dike rings, dredging activities, side-channels and retention areas. It is hard to judge which of these measures performs best given the present and future challenges in terms of climate, society, and the economy. It is particularly hard when people hold fundamentally different opinions on the threat of climate change, on the best way to deal with water and on the most desirable effects and priorities of river management strategies. The traditional approach to such controversies is to say that we need more scientific facts and knowledge to solve them. However, most controversies are not grounded in any lack of knowledge, but rooted in different values and interests (Sarewitz, 2004). The challenge is thus to identify a sustainable river management strategy that is acceptable to people with different opinions and able to cope with uncertainties in our physical environment (like climate change). This is what we call a socially robust river management strategy. A strategy that lacks social robustness may – under specific future conditions – lose societal support, possibly leading to untenable positions and forcing policy makers to take expensive adaptive measures or cancel plans.

25.2 The relevance of societal support

The early 20th century can be characterised by great faith in the human capacity to control water and nature. Normalisation of the Dutch rivers to facilitate year-round navigation, and extensively controlling the river by dike rings and dikes were the dominant *approaches*. As of the 1960s, however, a trend emerged towards less faith in progress, growth, and the potential to manipulate nature. This trend was caused by a combination of calamities, alarming publications, and a context of emerging environmentalism. The shift in perspective led to increased resistance to the paradigm of economic growth and control of nature and water. As a consequence, support for dike-related measures decreased and a stronger demand for environmentally friendly measures arose. Protests made continuation of traditional control measures impossible and a new policy paradigm was born: combining flood protection with habitat development while simultaneously improving conditions for agriculture and preserving historical values. The restoration of side-channels and floodplains became an important pillar of this new policy paradigm. What we learn from this is that perspectives and perspective change play an important role in the support for river management measures. Without societal support it may become impossible to implement measures or continue along the chosen policy path. It is thus important to understand perspectives and perspective change.

25.3 The Perspectives Method

Within the project entitled “Perspectives in Integrated River Management in River Deltas”, funded by Deltares and ICIS, we developed a method to make perspectives on water explicit and measurable in order to examine perspective change and socially robust river management. This method applies Cultural Theory perspectives (Douglas, 1970; Thompson et al., 1990) to water management (see Hoekstra, 1998; Middelkoop et al., 2004 for more information) and distinguishes four archetypical perspectives: Hierarchism, Egalitarianism, Individualism, and Fatalism. A perspective can be defined as a perceptual screen through which people interpret the world and which guides their actions (van Asselt, 2000).

- Hierarchists believe in controlling water and nature, and in government responsibilities, research, and expert knowledge. Water is mainly seen as a threat to human safety, and a sustainable water system thus highlights safety and flood prevention. As a consequence, preferred water policy options are “dike building”, “raising or widening dikes”, and “channelling” (Offermans et al., 2011).
- Egalitarians prioritize ecological restoration and nature development. More space should be given to nature and water. They prefer participatory decision-making processes giving everyone an equal voice. The water requirements of animals and plants should also be seriously considered, particularly in periods and areas with water shortages. As a consequence, they prefer “Room for the river”, restricting human demands, relocation to higher areas and a precautionary approach. A sustainable water system focuses on high sustainability with space for natural processes and reconsideration of human demands (Offermans et al., 2011).
- Individualists adhere to a more opportunistic point of view. They believe water offers great opportunities in terms of economy, creativity, self-development, and

recreation. They prefer an adaptational approach, and put great trust in technology and the market. In correspondence with their beliefs, their preferred water management policies focus on innovative projects, such as "amphibian housing", "living on water" and "building offshore islands". In their view, a sustainable water system is based on weak sustainability (Williams and Millington, 2004) with a focus on economic opportunities and innovative, technological solutions to unsustainable situations (Offermans et al., 2011).

- The Fatalist is not concerned about the future and sees life as a lottery. Everything is predetermined by destiny, which cannot be influenced by policy or individual actions. One has to enjoy every day and make the most of the present. Short-term pleasure and enjoyment are very important and adjusting one's behaviour to prevent future problems is useless. Developments like climate change or technological innovation are inherently uncertain; information about the past says nothing about the future. Developments may follow trend A today, while tomorrow it may be B or C. As a consequence, they adopt a passive management strategy of doing nothing (Offermans, 2012).

These archetypical perspectives can be operationalised in a so-called perspectives map (see Table 25.1), allowing real-life perspectives to be "measured" as mixtures of archetypes and visualised in a perspectives triangle (see Figure 25.1 and 25.2 in Sections 25.5 and 25.6).

Table 25.1 The perspectives map: for each issue (left column), the beliefs are given according to the four archetypical perspectives (second–fifth columns). To assess a person's perspective, this person has to endorse the beliefs he or she agrees with. As real-life perspectives tend to consist of a mix of archetypical perspectives, zero, one, two, three or even four beliefs can be endorsed for each issue. Each endorsed belief results in a score of one. All endorsed beliefs together form a real-life perspective and yield a score for each archetypical perspective (vertical sum with every marked cell representing a score of one). We normalise this score to four and calculate x-, y-, and z-values that can be plotted in a standardised tetrahedron to indicate the position of a real-life perspective with respect to the four archetypes. In this chapter, we use the Perspectives Triangle, which excludes the Fatalist, as the tetrahedron is difficult to visualize on paper. For more information see Offermans (2012).

	Hierarchism	Egalitarianism	Individualism	Fatalism
Value of water	Discharge of water, ice, sedimentation	A source of peace and quiet, space, nature	A source of material prosperity & self-development	Making my life more comfortable
Nature of problems	Serious, but manageable	Serious and hardly manageable	Something we do not need to worry about	Useless to think about or prevent
Climate change	Average trends	Extreme trends	Minimal trends	Not identifiable
Trust in technology	Moderate	Low	Large	Unproven
Important values	Structure and stability	Harmony and solidarity	Freedom and independence	Comfort & pleasure

	Hierarchism	Egalitarianism	Individualism	Fatalism
Water function priority	Preservation of current functions	Ecological recovery, compensation, habitat development	Economic functions, self-development, and innovation	Comfort, providing me with enough water
Safety	Flood prevention and control of discharge	Avoidance of flood-prone areas and acceptation of water	Adaptation to water by utilising opportunities & innovation	Interference is useless
Response to drought	Following guidelines and laws	Fair distribution between nature & human consumption	Market forces; rising prices in times of scarcity	No need to think about it. It will be alright
Water supply	Demand driven	Supply driven	Market driven	No different from now
Water system organisation	Control and regulation	Natural development and resilience	Opportunism and innovative technologies	Passivity, human interference is useless
Principle of spatial planning	Water follows functions, preservation of existing space	Water steers; functions follow water. Give up space if necessary	Water offers opportunities; functions utilise water. Creation of space on and around the water	Water should be used to enjoy life
Damage due to flooding	Should be prevented and otherwise compensated by government	Is a matter of solidarity; everyone is financially responsible	Is a matter of individual responsibility. Known risk of living in flood prone areas. Insurance	I do not want to look ahead to that
Responsibility	National Government	Regional governments and NGOs, in fact everybody makes their own contribution	Private companies and in risky areas (for example in flood plains) individuals	As I have enough water I can make decisions myself
Decision making based on	Standards from expert knowledge and research	Participatory processes with input from all stakeholders	Effects of the free market and privatisation. Cost–benefit analyses determine best choices	Not applicable: it is a waste of time
Identity; water contributes to	National identity and traditional export products	Catchment identity and solidarity	International identity and innovative image	My own identity and pleasure

The Perspectives Method focuses on making perspectives explicit and measurable, and can be used for several purposes. Here I briefly discuss three of its applications: as a tool to stimulate dialogue on desirable river management options, as a tool to analyse the past to learn about perspective change and societal support, and as a tool to analyse present and future support for water management policies.

25.4 A tool to stimulate dialogue

One application of the perspectives map (which is a fundamental part of the Perspectives Method) is that it makes beliefs underlying preferences or rejections regarding river management strategies explicit. Instead of just stating disagreement about strategies, measures or safety standards, it indicates possible reasons why people disagree. Disagreement may result from different beliefs concerning climate change, the role of water in spatial planning, the best way to achieve safety, parties that should bear responsibility for water safety, and multiple other aspects mentioned in the perspectives map. The map allows perspectives to be compared in terms of the beliefs that underlie agreement or disagreement. It thus functions as a basis for dialogue and offers opportunities for discussion and finding synergies. The archetypical perspectives can also be used to identify the strengths and weaknesses of different strategies according to each perspective. Consideration of the weaknesses identified by some perspectives may contribute to adapting the strategy and making it more robust (see Table 2 and Offermans et al., 2008).

Table 25.2 The Perspectives Method can be used to stimulate dialogue and reflection on a strategy from different perspectives. This allows strengths and weaknesses to be identified. By taking concerns from other perspectives into account, a strategy may become more acceptable and hence robust.

	Hierarchist response	Egalitarian response	Individualist response	Fatalist response
Example of a measure Amphibian living: houses that are able to rise and fall with the water level	Safety issues need more attention, notably prevention from drowning (children/ elderly) and accessibility for emergency services in times of high discharges. How to keep the entire infrastructure functioning in times of high discharges?	Appreciate that water is given more space. Fish, amphibians, and other fauna and flora should not be negatively affected. Is the river bank still suitable for breeding (fish and birds), is water pollution controlled?	Amphibian houses offer opportunities for ultimate housing enjoyment. Integration of water into spatial planning in an innovative way	Nice idea, but will only be beneficial for people who can afford to buy such an expensive house. Guarantees should be given that the water remains accessible to all: prevention of private, isolated “river islands”.

25.5 A tool to analyse the past

Another application of the Perspectives Method is to use the perspectives map to analyse past changes in river management strategies. An example is the analysis by Offermans and Cörvers (2012), who explained how perspective change contributed to changing societal support for strategies and ultimately to the implementation of different river management strategies, based on a literature study and a workshop with experts. As of 1900, they distinguished three periods that were unique in the way they deal with river management in the Netherlands (see Figure 25.1 and Offermans & Corvers, 2012). For each period the authors completed a perspectives map and tried to explain why perspectives changed, why they changed in a particular direction and what this perspective change implied for public support for strategies and policy changes. The authors identified catalysts for perspective change, for example media attention, and the occurrence (or absence) of events. They also found aspects that prevented perspective change or its acceleration, such as events that happen soon after the implementation of new strategies. Prevailing undercurrents (significant deviations from the dominant perspective) turned out to be important to explain the direction of change. For more information, see Offermans & Cörvers (2012).

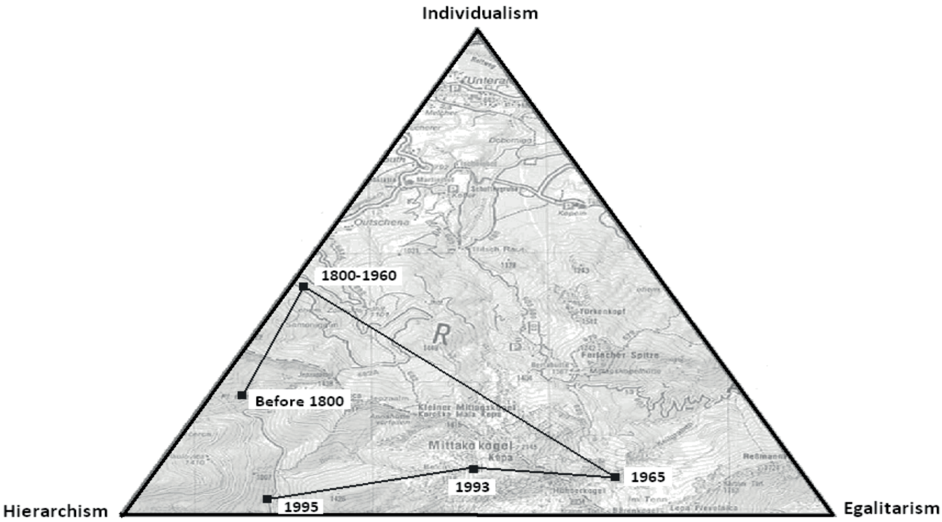

Figure 25.2 Visualisation of perspective change in Dutch water management from 1900 to 1995, based on perspectives maps for each period. The dominant perspective shifted from Hierarchical-Individualistic towards Egalitarianism, and back to Hierarchism again. Simultaneously we have seen the water management policy shifting from control, normalisation and dike reinforcements (1800-1960) towards restoration of floodplains and side-channels (from the 1960s onwards), and back to controlled flooding of the winter bed (after 1993). An important aspect is that perspective change does not evolve abruptly, but gradually.

25.6 A tool to analyse present and future support

The perspectives map can also be used to assess perspectives prevailing in policy documents and – subsequently – to compare these with the present dominant perspective among Dutch water professionals (see Offermans et al., 2013). The idea behind it is simple: if the policy perspective and the professionals' perspectives are too different, this may lead to problems regarding support from water professionals in the short term. If the two perspectives are similar, this is expected to be beneficial for short-term support. As they share the underlying beliefs regarding river management, the professionals may conclude that the policy recommendations are indeed the right thing to do. However, perspectives have proved to be dynamic and change over time. Change may lead to a divergence between the professionals' perspective and the perspective inherent in the policies. So even if both perspectives match now, this does not exclude problems regarding support in the future.

Figure 25.2 visualises the perspectives of Dutch water professionals who completed a questionnaire (the small dots with numbers). The black star refers to the dominant perspective in a major policy report (the "The Delta Committee Report", (2008). Here we see that the perspective adopted in a current policy report is more hierarchical than the currently dominant perspective among Dutch water professionals. In view of what was said above, this may lead to problems regarding support in the short term. Taking a closer look and comparing the perspectives maps of the policy report and the dominant professionals' perspective, we see that the disagreement can largely be reduced to different beliefs concerning three issues: response to drought, organisation of water supply, and the relation between water and spatial planning. Discussing these three issues may be a first step towards finding a more widely supported – and hence robust – policy. Of course, as regards *societal* support for the measures in the policy report, the perspectives of the Dutch public should be assessed, but this is something we have not done yet.

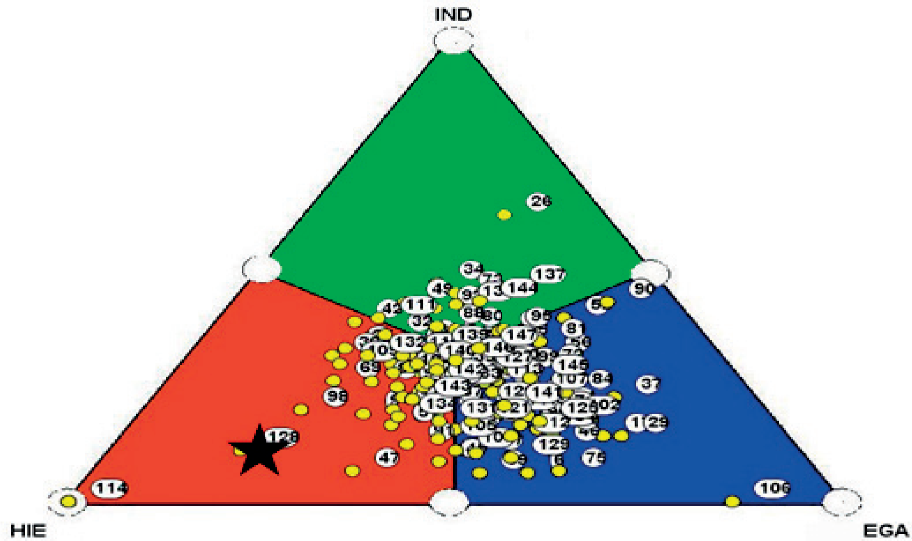

Figure 25.3 Visualisation of the present perspective of Dutch water management professionals (small dots with numbers) and the policy perspective (Delta Committee report, 2008). The current policy perspective is rather Hierarchical, whereas the Dutch water management professionals also show strong Egalitarian and Individualistic characteristics. A look at the perspectives map (which forms the basis for this figure) shows that differences mainly exist regarding the beliefs on drought, water supply and the place of water in spatial planning.

25.7 Conclusion

This chapter has summarised the Perspectives Method and three of its applications. Whereas the possible effects of climate change on water policy targets and objectives have been studied extensively, the consequences of perspective change have remained largely neglected for a long time. However, sustainable, robust river management strategies should not only be able to cope with developments in our physical environment (like climate change and variability), but also with developments in our social environment (perspective change). The Perspectives Method offers a first tool to explore and explain perspective change and its consequence for societal support and socially robust river management strategies. This chapter also illustrates that normativity plays an important role in issues related to sustainable river management. To solve sustainability issues, we not only need to obtain, accumulate, and integrate knowledge, but we also need greater insights into the different, normative interpretations of this knowledge. A dialogue may be a first step towards understanding the different normative interpretations underlying sustainability issues. Here I have presented one option to stimulate such a dialogue with the help of a perspectives map.

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Chapter 26

Successful joint knowledge production: beyond credibility, saliency, and legitimacy

Astrid Offermans and René Kemp

Abstract

Joint knowledge production (JKP) is a process in which scientists and policy makers collaborate in order to develop results that are relevant to both. In this chapter we discuss factors that are considered important for successful JKP: credibility, saliency, and legitimacy[57]. We explain that the interpretation of these concepts is inherently normative and we present Cultural Theory as a method to render different interpretations of these concepts explicit. Even after differences have been made explicit, however, JKP cannot be considered a spontaneous process; additional efforts from scientists and policy makers remain necessary for success.

[57] This chapter is based on the INSPIRATOR project that was funded by NWO and KvK and implemented by ICIS in collaboration with Utrecht University, YM de Boer Advies and Femke Merkx Kenniscocreatie. The goal of the project was to delineate conditions for successful joint knowledge production, based on an evaluation of joint knowledge production projects in the Netherlands in the area of climate adaptation.

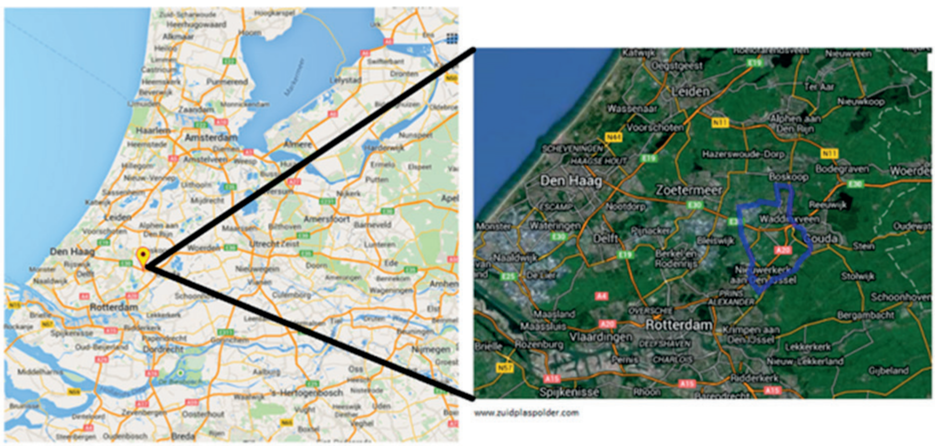
26.1 Introduction

Several approaches to achieving fruitful links between science and policy have been discussed in the literature (see Hoppe, 2005, 2011; Pielke, 2007; Pohl & Hirsch Hadorn, 2007; Scholz & Marks, 2001) and implemented in practice. One of these approaches involves the concept of joint knowledge production, or to use its acronym, JKP (see Hoppe, 2005; Pohl & Hirsch Hadorn, 2007; Regeer & Bunders, 2007; Van Buuren & Edelenbos, 2004 for more information). JKP can be defined as a process in which scientists and policy makers collaborate in order to develop results that are relevant to both (Hegger et al., 2013; Hegger et al., 2012). It is said to lead to better, more policy-relevant or socially robust knowledge, to enhance mutual understanding, to enable parties to understand each other's language; and to do justice to different forms of knowledge (Hegger et al., 2012; van den Hove, 2007).

Following Cash and others (2003), a project can only be considered successful in terms of JKP if all project members agree that the knowledge produced is credible and salient and that the knowledge production process was legitimate. Credibility concerns the scientific appropriateness of evidence and arguments (Cash et al., 2003) which involves building upon the existing literature and theories and developing verifiable and reproducible empirical research. Saliency refers to the relevance of the knowledge produced to decision makers. The knowledge produced should thus be considered useful and important. Legitimacy reflects the perception that the production of the knowledge has been fair, unbiased, and respectful towards different values and beliefs of stakeholders (see Cash et al., 2003; Hegger et al., 2013 for more information). In reality, as we learned in the INSPIRATOR project, project members may have different interpretations of these three concepts, and we therefore argue that credibility, saliency, and legitimacy are inherently normative. Different, diverging interpretations of the concepts may exist within a project team. The fact that these interpretations may differ does not mean that some are more correct or desirable than others: all interpretations are valid in themselves. However, to achieve successful JKP, all members need to agree that the project meets their specific interpretations of credibility, saliency, and legitimacy. This implies that the different interpretations of these three concepts have to be made explicit during a project, which is however easier said than done.

Box 26.1 An example of a JKP project: Waarheen met het Veen?

The project “Waarheen met het Veen?” (translated: “What to do about the peatland?”) aimed at a climate-proof design for the Zuidplaspolder, which is the lowest-lying location in the Netherlands (6.7 m below sea level). In response to strong (safety-related) objections to design plans including the construction of housing and business areas in the low-lying Zuidplaspolder, one of the Dutch ministries appointed the area a “Hotspot”: a location where scientists, policy makers and practitioners work together. At Zuidplaspolder, actors from universities, the Zuid-Holland provincial authorities, the district water board of Schieland and Krimpenerwaard, several advisory agencies, and contractors all worked together in an innovation lab that was run in parallel with the (debated) regular planning processes. Two people were simultaneously involved as members of the innovation lab team and the regular planning process team. One of them was assigned the role of the innovation lab’s ambassador to communicate results to other officials. During the project, the innovation lab collaborated intensively with several partners, including project agencies, the water board, environmental organisations, and universities. The innovation lab performed 3 types of research: investigating the potential consequences of climate change for the Zuidplaspolder, designing options for a climate-proof design of the polder and a societal cost-benefit analysis for selected options. The project concluded that the existing plans sufficiently considered the possible impacts of climate change. In a response to this conclusion, the responsible minister, Jacqueline Cramer, set aside 24 million euros for a climate-proof design of the Zuidplaspolder.



Location of the Zuidplaspolder in the province of Zuid-Holland

26.2 Perspectives on credibility, saliency, and legitimacy

Just as people have different perspectives on the ability of nature to deal with stress (Schwartz & Thompson, 1990) and the role of governments in counteracting environmental degradation and fostering wellbeing, people may have different perspectives on what credible and salient knowledge is and what a legitimate knowledge production process looks like. Cultural Theory (Douglas, 1970; Thompson et al., 1990) is an empirically validated typology that allows one to differentiate between various interpretations. Although Cultural Theory was initially developed to classify, analyse, and interpret the behaviour of communities according to their (religious) rituals (Douglas, 1970), it has been applied to a diversity of topics, including nature and resources (Thompson et al., 1990), uncertainty and risk (Rayner, 1992; Renn, 1992; Rotmans & de Vries, 1997; van Asselt, 2000), problem structuring (Hoppe, 2011), energy (Janssen & de Vries, 1998), and water (Hoekstra, 1998; Middelkoop et al., 2004; Offermans, 2012). Cultural Theory distinguishes four stereotypical perspectives, each of which can be defined as consistent interpretations or “Perceptual screens through which people interpret the world and which guide them in acting” (van Asselt et al., 2001), viz. hierarchism, egalitarianism, individualism, and fatalism. Applied to knowledge and knowledge production (see Hegger et al., 2013), a hierarchist would differentiate strictly between scientific knowledge and other types of knowledge like tacit or practical knowledge. The analysis of problems should be deferred to scientists using structured, validated, and proven research methods. They believe that good scientists are able to determine the causes of problems and to evaluate policy options in a non-partisan way, and that normative discussion should be prevented. Egalitarians acknowledge and appreciate different forms of knowledge and consider science to be fragmented and constrained by disciplinary focus and methods. Gaining knowledge and translating it to feasible interventions can never be value-free, as it involves choices about what matters. Egalitarians want knowledge to be subjected to extended peer reviews and dialogues, also outside the academic context. Individualists are pragmatic, strategic, and opportunistic. Scientific knowledge differs from other knowledge types, but is not necessarily better, or more complete. For some projects, practical knowledge may even be sufficient. A good scientist is pragmatic, and as a result, not all research results will be equally objective or independent. Everybody has their own responsibility to carefully select and evaluate knowledge and information. Collaborations between scientists and policy makers offer opportunities for self-development, creativity, and networking. Finally, fatalists attach equal value to scientific knowledge and other knowledge sources. They believe that the political agenda determines the content and results of scientific research. Collaboration between scientists and policy makers can be interesting, but conflicts (once manifest) are mostly unsolvable.

26.3 Operationalising perspectives on knowledge production

To visualise and operationalise different interpretations of credible and salient knowledge and legitimate knowledge production, we developed the so-called Perspectives Map (Table 26.1). The second column presents topics that are considered important for credibility, saliency, and legitimacy (first column). Columns 3-6 present the different perspectivistic interpretations of the topics.

Table 26.1 An operationalisation of different perspectives on credible and salient knowledge and legitimate knowledge production processes.

	Hierarchical	Egalitarian	Individualistic	Fatalistic
Credibility				
Scientific peer review (of articles reporting on research results)	Is a good and valid method to safeguard quality	Works well in strictly demarcated and disciplinary research fields	Over-values the scientific use of knowledge and is too disciplinary	Is mainly a matter of nepotism
Testing of scientific results by people outside academia	Is sometimes necessary to gain or preserve public support	Is necessary to involve marginalized groups and to test knowledge claims	Is often time-consuming and hardly contributes anything	Gives external people an unjustified feeling that their assumptions are taken seriously
Value-free science	Can be ensured by following valid and proven research procedures	Can never be fully ensured, so it is important to be transparent	Is an illusion, but not necessarily a problem	Everybody will try to focus on their own fads and fancies; control hardly helps
An ideal scientist	Is a pure scientist who performs research independent from the political context	Is a scientific referee who creates trust and legitimacy by starting a dialogue (also with people outside the scientific community)	Is a scientific advocate who promotes certain choices based on research	Is a scientific broker who provides a balanced overview of all options and possibilities
Distinction between science and other knowledge sources	Procedures and skills make scientific knowledge fundamentally different from other knowledge sources	Scientific knowledge and other knowledge sources are fully complementary	The choice between scientific knowledge and other knowledge sources depends on the topic at hand	There is no fundamental difference between scientific knowledge and other knowledge sources

	Hierarchical	Egalitarian	Individualistic	Fatalistic
Saliency				
Most important role for science	Offering empirical and validated data	Contributing to social learning and communication	Providing insight into complex problems	Depends on context and time
Science's contribution to policy lies in	Offering solutions to problems	Identifying problems	Offering knowledge that allows policy makers to solve problems	Answering policy questions
Influence of science on policy	More science leads to better policy	Synergetic relations result in reciprocal advantages; science and good policy go hand in hand	More science does not automatically result in better policy. Sometimes other knowledge sources are even more useful than science	More science leads to more uncertainty
Most important output in boundary projects	Publications	Gaining shared and useful knowledge	Career opportunities and self-development	Valuable experience
Legitimacy				
Interdisciplinarity (collaboration between scientists from different academic disciplines)	Brings us closer to understanding complex issues	Is inherently risky and possibly even an illusion because of differences in power and status	Broadens the horizon too much; impossible to keep an overview; differences between important and unimportant things fade	Is a trick to never claim the truth, or a reason to blame when making mistakes
Scientists and policy makers (and the differences between them)	Are complementary, but only the scientist knows how they complement each other	Are subordinate to the willingness to collaborate and personal characteristics	Keeps partners in a project attentive	Are unbridgeable and often conflicting
Influence of policy on science	Collaboration between scientists and policy makers is often at the cost of scientific quality	Collaboration between scientists and policy makers benefits social relevance; it leads to synergies	A good scientist will not be influenced by pressure from politics	The policy agenda determines the output and direction of science to a large extent
Problem solving	Demands more insight into the complexity of societal problems	Demands more insight into unequal power distributions and listening to marginalized groups	Demands creativity	Demands patience and a bit of luck

	Hierarchical	Egalitarian	Individualistic	Fatalistic
Stakeholder input	Is often one-sided. It is good to put this in a broader perspective with the help of scientific knowledge	Is complementary to scientific knowledge, but too often neglected; more and better inclusion of stakeholders in scientific research would lead to more feasible policy	Depends on topic and goals; it may be efficient and necessary, but may also lead to unnecessary delays	Science is one of the stakeholders that may be involved in a project; knowledge from other sources is equally relevant

26.4 Towards more successful JKP

How could different interpretations of credibility, saliency, and legitimacy hamper the success of a JKP process? Let us try to explain this by using the example of "testing scientific results by people outside academia" (third row in Table 1). The first question is whether testing research results outside academia is considered important or necessary to develop credible knowledge (hierarchism and egalitarianism) or whether it is interpreted as a way to fool people or a waste of time (fatalism and individualism). Even when project members implicitly or explicitly agree that testing research results outside the scientific ivory tower is necessary, successful JKP is not yet guaranteed. People may hold different views and expectations regarding the role of these tests within the project. Hierarchists will mainly emphasise the instrumental benefit of testing results outside academia, which may be necessary to preserve social support. Egalitarians on the other hand will expect the tests to offer valuable information that – in order to develop credible knowledge – needs to be fed into the knowledge development process again. Ignoring these differences runs the risk of members becoming dissatisfied and even disappointed with the knowledge produced, seriously hampering the success of the JKP process. In the above example, the knowledge produced will not be considered credible by an egalitarian if the testing procedure is only used in a hierarchical way to preserve support. An attempt at rendering the different interpretations (and the accompanying expectations) regarding knowledge and knowledge production explicit is given in Table 1, which offers an interpretative assessment based on Cultural Theory, to be scrutinised empirically. It should be stated that the aim of Table 1 is not to force people to agree on any interpretation of any topic. We actually believe that the interaction between different perspectives is useful, enriches the knowledge production process and increases the robustness of its outcomes. For this to happen, it is important that people become aware of each other's knowledge and perspective. Table 1 may help to enhance this transparency.

26.5 Other relevant preconditions for successful JKP

Although the above explanation of interpretations of credibility, saliency, and legitimacy may contribute to more successful JKP, it is by no means enough to guarantee success, as many more factors play important roles. The INSPIRATOR project (Hegger et al., 2013; Hegger et al., 2012) combined a literature study with interviews to explore, unravel, and better understand conditions contributing to successful JKP. The interviews were performed with people who had had experience of working in JKP projects as scientists, program managers, decision makers, or funders. Seven success conditions were derived from the literature and verified by the interviews (see Hegger et al., 2012 for more information):

1. Involve as many actors as possible. In an ideal situation, all crucial parties are involved in a JKP process. However, as large group sizes may negatively affect the manageability of projects, the aim is to involve as many stakeholders as necessary, and as few as possible.
2. Pay sufficient attention to joint problem structuring. Different interests or perceptions regarding the core of the problem may result in "jumping to solutions" too fast, hampering the success of JKP.
3. Find and elaborate joint frames, for example via "boundary object" that enhance and facilitate communication between different groups; they help to create "common ground" while still allowing different ways of defining a phenomena or giving meaning to it. The idea of a climate-proof design can be considered a boundary object in the case study described in box 1.
4. Transparently position your research project in terms of its orientation and organisation. It should be clear at the start of a project to what extent it is oriented on scientific knowledge development and/or policy development.
5. Be explicit (particularly as a scientist) about your role. It is generally agreed that scientists are supposed to do research and should not engage in (political) decision making, whereas policy makers have to take responsibility for making decisions based on their interpretation of research results **(Pielke, 2007)**. Of course, role divisions in JKP processes are not always clear-cut (Pielke, 2007). Nonetheless, transparency about roles is believed to foster success.
6. Anticipate on reward structures that impede successful JKP. Successful collaborations and successful JKP are generally not considered criteria to evaluate the performance of scientists or policy makers. Of course, this condition can hardly be met by project members themselves, as it refers to more institutional obstacles towards successful JKP. It would require contextual solutions like making funds available for JKP, or the development of new performance indicators based on valorisation.
7. Manage facilities that encourage knowledge exchange. This might involve including independent knowledge facilitators (or knowledge brokers), providing suitable

venues to meet, and using the correct methods and techniques to stimulate creative thinking.

26.6 Conclusion

Collaboration between scientists and policy makers may result in knowledge that is publishable in academic top journals and applicable to practice. This is not, however, a spontaneous process and requires additional efforts from scientists and policy makers. The process of joint knowledge production (JKP) is considered successful if all actors recognise the knowledge produced to be credible, salient, and legitimate. The Perspectives Map presented above (based on Cultural Theory) may contribute to rendering the different interpretations of credibility, saliency, and legitimacy explicit in order to do justice to different interpretations of the three concepts. Subsequently, continued efforts are needed to maintain roles, interests, problem definitions, possible solutions, and pathways to these solutions as subjects of discussion. The role of all members – in particular scientists – needs to be transparent at all times. Finding a healthy balance between being involved as a project member and keeping one's distance as an honest broker is not always evident and is best made explicit. The Perspectives Map offers a way to do this.

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Chapter 27

Knowledge production in sustainability partnerships: an exploration of the Round Table on Sustainable Palm Oil[58]

Astrid Offermans and Pieter Glasbergen

[58] This chapter is based on Offermans, A. & Glasbergen, P. (2015). Boundary work in sustainability partnerships: an exploration of the Round table on Sustainable Palm Oil. *Environmental Science and Policy*, 50, 34-45.

Abstract

Sustainability partnerships have the potential to function as boundary organisations that bring together stakeholders from different domains of society to jointly produce knowledge linked to action. However, little is known about the practice of knowledge production in such arrangements. In this chapter we develop an analytical framework, based on attributes of the nature of knowledge, the process of knowledge production, and the organisation of this process, to analyse the extent to which knowledge processes in partnerships can be understood as joint knowledge production (JKP). By way of example, we apply the framework to the case of the Round Table on Sustainable Palm Oil (RSPO), and show that science and scientific knowledge do not necessarily play a dominant role in such boundary organisations.

27.1 Introduction

Scientists and policy makers increasingly acknowledge that sustainability challenges cannot be solved through traditional, linear modes of knowledge production (Cornell et al., 2013). The complexity and interwovenness of sustainability problems encourage the inclusion of a range of stakeholders in problem-defining and problem-solving processes (McNie, 2007). These stakeholders have different values and interests, but also different types of knowledge. The growing involvement of stakeholders therefore means that the traditional prominence of scientific knowledge is increasingly faced with competition from other knowledge claims (Edelenbos et al., 2011), including representatives of the business community and actors from civil society. Although the knowledge held by these actors differs in nature, an integration of different knowledge types is believed to create unique benefits for decision making, including a better understanding of problems, the development of socially robust decisions, and closer links between knowledge and action (Lee et al., 2014). This process of knowledge integration is commonly termed "joint knowledge production" (JKP).

Partnerships for sustainability certification, for example in the field of agricultural commodities, can be conceptualised as so-called boundary organisations that bring together stakeholders from different domains of society (state, market, civil society) to jointly produce knowledge linked to action. Examples of such partnerships are the Stewardship Councils (Auld, 2010; Kalfagianni & Pattberg, 2013; Pattberg, 2005) and Round Tables (Cheyns, 2011; Ponte & Cheyns, 2013; Schouten, 2013; Schouten et al., 2012). Hundreds of partnerships have been developed for sustainable agricultural products like coffee, cocoa, and cotton (Ecolabel-Index, 2015). Most of them are business-NGO collaborations; although partnerships maintain relations with governments and scientists, these actors are not official members of the partnership.

Up to now, research into these partnerships has mainly focused on achieving or enhancing agreement between different members, and also on the role of trust, collaborative advantage, and leadership (Austin & Seitanidi, 2012; Glasbergen, 2011). Although the learning potential of partnerships, and their potential to gain and accumulate knowledge for sustainable development, has been acknowledged (Juhola & Westerhoff, 2011; Pedroso & Nakano, 2009; Schouten et al., 2012; Tennyson, 2005; Van Huijstee et al., 2007; Von Geibler, 2012), little is known about the practice of knowledge production in partnerships (Grant & Baden-Fuller, 2004; Phelps et al., 2012).

The focus on knowledge production processes in sustainability partnerships is rather new, and introduces a novel perspective on their functioning as it highlights their role as boundary organisations. Boundary organisations are platforms on which independent actors from different societal domains interact, with interaction intended to result in problem-focused collaborative actions. What we also see is that co-production of knowledge takes place in boundary organisations and that this knowledge is linked to action (Boezeman et al., 2013; Hoppe, 2005; Hoppe & Wesselink, 2014; Lee et al., 2014;

Schut et al., 2013). Actors in boundary organisations originate from different domains of society and represent specific interpretations of reality, worldviews, and types of knowledge. The same can be said about actors in sustainability partnerships. However, although this is an assumption based on literature, we wonder whether the actual knowledge production processes in sustainability partnerships can in practice indeed be understood as joint knowledge production (JKP). To answer this question, we suggest an analytical framework to operationalise and analyse JKP in sustainability partnerships as boundary organisations.

27.2 Knowledge production in sustainability partnerships – an operationalisation

Sustainability partnerships refer, by definition, to collaborative arrangements that involve actors from different domains (particularly from NGOs and business) working together towards a sustainability goal. We expect that collaboration between these different stakeholders influences the characteristics of the boundary work in sustainability partnerships. We distinguish implications for the *nature* of the produced knowledge, the *process* of knowledge production, and the *organisation* of knowledge production in partnerships. First, we expect to find different types of knowledge, including scientific knowledge, practical knowledge, and tacit knowledge. We should not forget that certification tries to steer the production processes of agricultural products like coffee, palm oil, and tea into a more sustainable direction. The farmers whose production processes are to be changed may have relevant knowledge about the way different approaches work in practice. This may include knowledge based on experience (practical knowledge), or knowledge based on unwritten rules and habits passed on through generations (tacit knowledge). Second, the multi-actor character of the arrangements and the work on the interface between different sources of knowledge suggests that knowledge processes are not linear but inherently integrative. This implies that different knowledge types and ideas are integrated (both consciously and unconsciously), rather than being chosen or voted upon. Third, we acknowledge that knowledge production is not a spontaneous process, but must be managed.

An important starting point in our approach is that knowledge processes cannot simply be classified as either entirely jointly produced (JKP) or entirely focused on traditional (scientific) knowledge production. JKP should be analysed on a continuous scale, which allows the identification of first steps towards JKP as well as hybrid mixtures of JKP and traditional, science-focused knowledge production. To this end, we have adopted a quantification approach and visualised the process of JKP and its different phenomena (or components) in a spider diagram (see Figure 27.1). The diagram consists of ten building blocks: four of them relate to the *nature* of knowledge in partnerships, four to the *process* of knowledge production, and two to the *organisation* of knowledge production. Each building block can be scored; the higher the scores, the more a partnership's mode of producing knowledge can be understood as JKP. For more information on the scoring procedure, see Offermans and Glasbergen (2015).

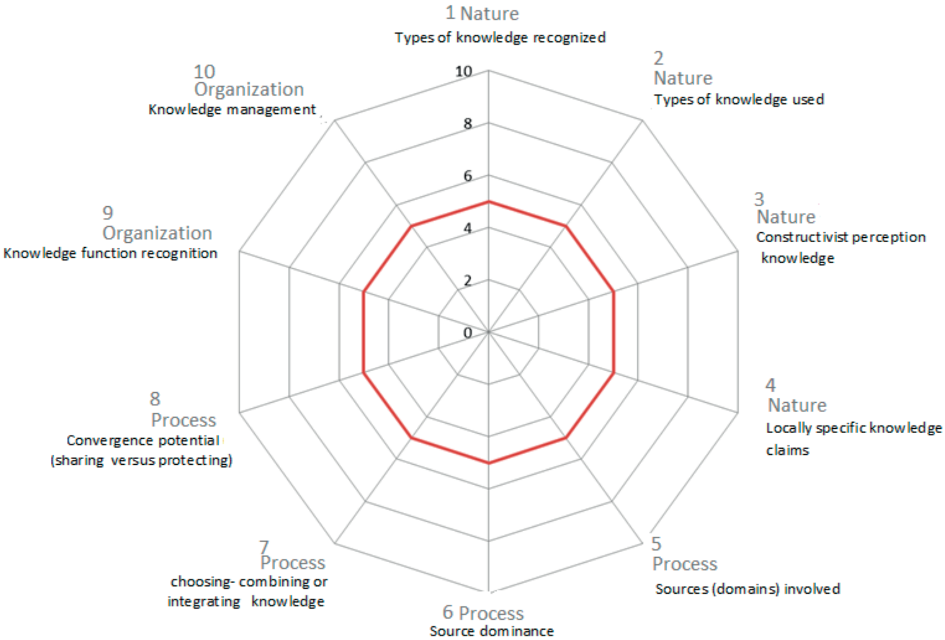

Figure 27.4 Analytical framework to analyse joint knowledge production (JKP) in sustainability partnerships

Nature of Knowledge Production – building blocks 1-4

The first building block in Figure 27.1 refers to the types of knowledge that are recognised in knowledge production in partnerships. The more (different) knowledge types are recognised, the higher the JKP score for this building block. A maximum score is obtained if the values of scientific knowledge, practical knowledge, and tacit knowledge are all recognised by the partnership members. In the second building block, we analyse whether the knowledge types recognised are also actually *used* as input in the knowledge process (e.g. to explain or justify decisions being made). Building block 3 analyses how research results, information, and knowledge are interpreted by the partnership members. The scale varies from very positivist (lowest score) to very constructivist (highest score). Building block 4 looks at the extent to which knowledge claims in partnerships are mostly of a generalised nature (lowest score) or only applicable on a local scale (highest score).

Process of Knowledge Production in Partnerships - building blocks 5-8

Building block 5 indicates whether different membership categories are involved in the knowledge production process. In most partnerships, these categories are predefined. A maximum score is obtained if a clear majority of the different membership categories (domains) have had a say in the knowledge process. The sixth building block analyses the share of each domain in the knowledge production process. A high score is awarded if all domains have a more or less equal input in the knowledge process. Building block 7 refers to the intensity of knowledge integration, and ranges from choosing (lowest score) to combining (medium score) to integrating different knowledge inputs (highest score). The convergence potential (building block 8) assesses whether partnership members are open to unconstrained knowledge sharing and hence have the potential to learn and converge (highest score). A low score is given if members are very protective of their knowledge base and seem reluctant to share knowledge with others.

Organising Joint Knowledge Production in Partnerships - building blocks 9-10

Building block 9 analyses whether partnership members recognise their partnership as a knowledge producing arrangement. This scale ranges from “not at all” (lowest score) to “entirely” (highest score). The final building block (number 10) analyses whether boundary work is managed in partnerships. Once again, we look at management on a continuous scale. Between fully managed (highest score) and no management (lowest score), there may be hybrid versions of knowledge management (for example in line with conflict management).

27.3 Applying the framework to the RSPO

By way of example, we applied the framework of Figure 27.1 to the Roundtable on Sustainable Palm Oil (RSPO). The RSPO is one of the most important and high-profile sustainability partnerships (Ponte & Cheyns, 2013). Its goal is to transform markets to make sustainable palm oil the norm, and they claim to have more than 1000 members (Pesqueira & Glasbergen, 2013; Schouten, 2013; Schouten & Glasbergen, 2012). Ordinary members are divided into seven subgroups: banks and investors (11 members), consumer goods manufacturers (334 members), environmental or nature conservation NGOs (26 members), oil palm growers (120 members), palm oil processors and traders (310 members), retailers (46 members), and social and developmental NGOs (12 members). They hold a yearly General Assembly (GA) with voting rights for all ordinary members, and yearly Round Table (RT) meetings. Detailed minutes of meetings are accessible to the public at large through their website. We analysed the minutes of GA6 (in 2009) and GA10 (in 2013) and the written answers of RSPO members to the question what they hope to gain from joining the RSPO and/or how they can potentially contribute to the RSPO. Finally, we analysed the content of presentations and welcome sessions during the first day of the tenth RT (in 2012). Based on our analysis, we scored the different building blocks in the spider diagram of Figure 27.1. For more information on the methodological procedure, see Offermans and Glasbergen (2015).

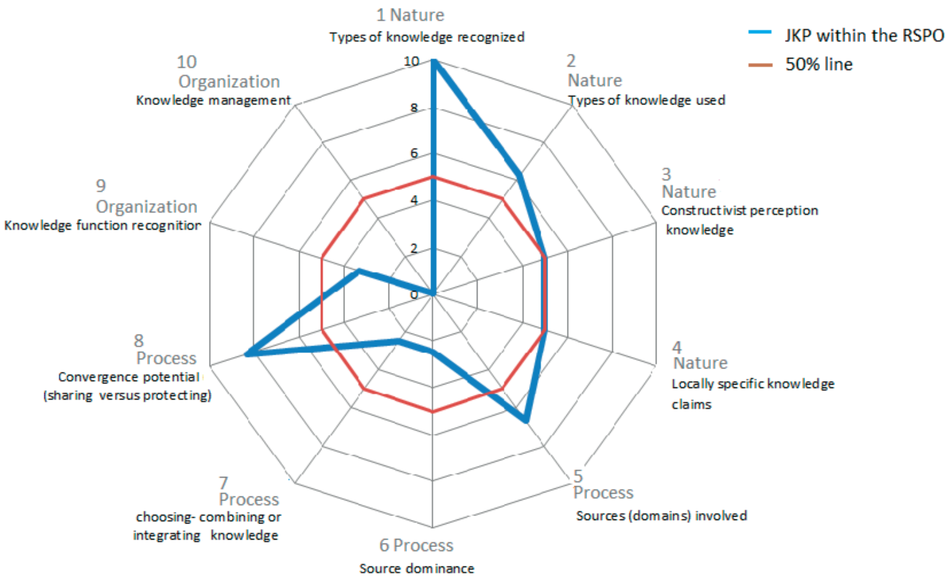

Figure 27.5 Results of applying the JKP analytical framework to the RSPO

The Nature of Knowledge Production in the RSPO

We observed a strong emphasis on *expert* knowledge. During the GAs and RT, value was attached to research results from research institutes and particularly NGOs: "*I also want to highlight and recognize the work of NGOs who worked hard to promote sustainability. WWF has made use of satellite technologies [..] and [..] developed a tool using the Google maps engine. This tool illustrates the impact of degraded forest and shrinking forest on wildlife and biodiversity*" (official address RT 10). Although expert knowledge was most prominent, smallholder knowledge (whether overt or tacit) was recognised as well, in both GAs and the RT. Members stated, for example, that smallholders have unique knowledge about the way different management options apply to their situation. However, although being recognised for its value, smallholder knowledge was hardly *used* in the knowledge process. Overall, a diversity of knowledge types were acknowledged, but NGO-driven expert knowledge was most dominant.

The third building block in Figure 27.2 shows a balance between positivist and constructivist interpretations of knowledge. Positivist interpretations related to statements about fact-driven measurement tools (and the underlying assumption that they tell the absolute truth) or the importance attached to scientific proof and expert knowledge. Regarding the *applicability* of knowledge (building block 4), we observed a balance between generalised and localised knowledge claims. GA6 and the RT often discussed the possibility to apply lessons learnt elsewhere in the world to the RSPO working area, thus focusing on generalised knowledge. GA10 however, emphasised explicitly that smallholders in Indonesia cannot be compared to smallholders in the rest of the world, indicating a more localised approach towards knowledge claims.

The process of Knowledge Production in the RSPO

Regarding the domains involved in knowledge production (building blocks 5 and 6) we observed that all domains were encouraged to supply and demand knowledge. The most common (and dominant) knowledge supply came from NGOs, while the least direct contributions came from banks and investors, universities, and research institutes. We conclude that the knowledge supply is diverse as regards the domains involved in producing knowledge, but also relatively homogeneous because of the unequal input dominated by NGOs.

On the knowledge integration scale (building block 7) the RSPO does not go beyond combinatory efforts. At the GAs, different opinions and knowledge sources were referred to and different domains were involved in knowledge production. However, at a certain moment this process of responding to each other and to the resolutions at stake was simply stopped to start a voting procedure, in which RSPO members had the possibility to vote for or against a resolution, or to abstain from voting. This is a matter of choosing knowledge types and sources rather than of combining or integrating them.

The convergence potential of the RSPO (building block 8) is high. During the GAs and RT, RSPO members did not seem reluctant to become involved in the knowledge production process and to share thoughts and knowledge. Based on the answers on the RSPO website, it seems safe to argue that the desire that was expressed to exchange ideas and best practices will most probably lead to learning and possibly to knowledge convergence.

Knowledge Management in the RSPO

Whether the RSPO is recognised by its members as a knowledge producing arrangement (building block 9) is debatable. The set-up of the roundtable meeting was academic, with PowerPoint presentations and the submission of abstracts. Almost all sampled abstracts referred to knowledge. This set-up suggests that people attend the meeting with a view to learning or sharing knowledge. The analysis of answers on the website, however, showed a different pattern. Of the 171 answers we analysed, 60 contained a reference to knowledge. Only ten members explicitly used the term knowledge. This implies that the knowledge producing function of partnerships is recognised, but not very strongly. The last building block (number 10) had the lowest score in the entire framework. This means that there were no signs of knowledge management in any of the meetings analysed. In the GAs and RT, time was constrained and controlled through time management, but there were no signs of knowledge management.

27.4 Conclusion

Although this is only an example, the application of our framework to one of the best-known sustainability partnerships (RSPO) reveals some characteristics of boundary work in such arrangements. First, scientific knowledge is only brought in sporadically, and mainly by actors outside academia or research institutes. Universities and research institutes have no direct knowledge input in boundary work in the RSPO. Although the knowledge input is fairly diverse, the *use* of these different inputs is rather restricted. Second, the knowledge supply is strongly dominated by NGOs. It is also notable that tacit knowledge from smallholders is recognised for its value, but hardly used in the knowledge process or decisions. Third, different knowledge inputs are selected rather than integrated. Diverse knowledge inputs were introduced into the discussions, but discussions were stopped to start a voting procedure. This is a matter of choosing between different knowledge inputs rather than integrating them. Fourth, knowledge production and knowledge processes are hardly managed. Time and decision-making were organised and closely controlled, but there were no attempts to systematically deal with knowledge or knowledge processes.

In general, this first application of our framework indicates that boundary work in sustainability partnerships tends to be a a joint effort to a limited extent as far as knowledge production and knowledge processes are involved. Following from this, we can also conclude that the partnership's most important knowledge product – the sustainability certificate – is only partly a joint outcome. This is remarkable, as the objective of organisations like partnerships is precisely to bring different domains together in a collaborative process to work out new management practices.

The results also say something about the practice of spanning boundaries, and more particularly about the role of science in spanning boundaries. Research into boundary work frequently presumes active involvement of researchers and scientific knowledge. Although scientific knowledge is negotiated in boundary work, it is still considered to be an essential addition to other types of knowledge. However, the application of our framework to the RSPO shows that research into boundary work should extend its scope beyond the often used, but restricted, areas of science and policy. The RSPO is probably only one example of a boundary organisation where researchers are not even directly involved in the knowledge production process and where scientific knowledge only plays a minor role.

It is not our aim to develop the framework into a fully objective measurement tool (if this is possible at all). The most interesting and promising use is probably its potential use as a dialogue tool to open up discussions about, and reflect upon, boundary organisations. Using the spider diagram in a deliberative context may lead to scoring or rescoring the building blocks by introducing new evidence or suggesting changes in the way knowledge is produced, and by doing so, removing boundaries between different domains and reduce their dominance.

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Chapter 28

Co-creative planning approaches inspiring high-quality growth

Reina Pasma and René Cimmermans

Abstract

In the Dutch province of Limburg, the prospect of growing problem of unoccupied houses and buildings, resulting from demographic and economic changes, has led the provincial authorities to develop a new approach to the transformation of the building stock. New modes of governance are being developed using co-creative approaches, which have brought about the integrated Provincial Environmental Plan (PEL) Limburg. A new policy concept of dynamic stock management is being developed in a co-creative process with stakeholders and local authorities. The process continues beyond the adoption of the plan: it also stimulates stakeholder and (local) government cooperation in the region. Starting from the shared desire for a high-quality physical environment in Limburg and through processes of co-creative visioning, implementing a regional agenda, and travelling along a shared learning path, new modes of working are being jointly discovered and developed.

28.1 Demographic change as a driver for a new policy approach

European demography is changing dramatically, as demographic development in recent decades has shown a shift from population growth to ageing. Demographics show an increasing share of older persons and a declining share of young and working-age people in the population. Prognoses show that this trend will continue in the coming decades, and the population is projected to continue to age (Eurostat, 2014).

The same trend is seen in Limburg, the southernmost province of the Netherlands. On top of the ageing trend, Limburg is also the first Dutch province to show a long-term population decline (live births minus deaths < 0), a trend that has begun in the south-eastern part of the province and is progressing towards the northern Limburg communities (NEIMED, 2014).

In Limburg, these demographic trends, combined with the economic crisis and developments in sustainability and innovation, are reflected in dwindling and changing demands for properties, land and real estate, causing an growing level of vacancy. This applies to industrial sites as well as to dwellings, offices, and retail properties. Although the developments appear to be very different in the various regions of Limburg and the effects are most apparent in the Southern Limburg region, the symptoms are felt throughout the province. The same pattern is also seen in other parts of the Netherlands and Europe (Janssen et al., 2012).

By way of example, this development is discussed below for the housing and retail property stocks.

The Limburg housing market shows an intriguing paradox. In terms of sheer numbers, there are too many houses available (see Figure 28.1). But there is a deficiency of houses with the required quality features. This implies that, although the changing population is resulting in a housing surplus, there is a need for a new construction boost to meet the changing quality requirements of future housing consumers in terms of life course and sustainability. The housing market does not live up to these consumer requirements, resulting in shortages in specific market segments. This effect is becoming clearly evident in the current period of economic crisis, but is in fact structural and connected to:

- decreasing growth in household numbers but growing share of single-person households;
- increasing share of aged people in the population;
- increasing demand for rented housing, not only cheap but also in the higher price categories;
- increasing demand for sustainability and energy efficiency;
- surplus of houses that were built in the post-war period and no longer meet present-day quality standards.

Province of Limburg region	Existing housing stock		Additional housing requirement (until 2020)	Planned and legally committed stock	Surplus (until 2020)
	total	vacant			
Northern Limburg	120,000	3,700	4,100	9,900	5,800
Central Limburg	104,000	4,200	3,800	10,700	6,900
Southern Limburg	291,000	10,900	1,000	12,100	11,100

Figure 28.1 Housing stock in Limburg in 2012. The Limburg housing stock is monitored on a yearly basis by the provincial authorities.

To redress the present unbalance, additions to the Limburg housing market should provide the right type of dwellings and be simultaneously accompanied by demolition of existing stock which lacks the desired consumer and sustainability quality features. This implies a major transformation by restructuring residential areas and substantial renovations of existing housing stock, including sustainability investments which significantly extend the lifespan of dwellings.

This "transformation without growth" distinguishes the Limburg situation from other Dutch regions, such as Amsterdam and Utrecht, which still require increasing numbers of dwellings and new residential areas, thus providing opportunities for a more gradual pathway towards new quality standards.

In the Netherlands, and also in Limburg, the retail sector is suffering from "unhealthy" outlet vacancy rates, which in recent years have increased to about 10% (see Figure 28.2). Prognoses show that in the years to come, these rates will grow to 25%, due to both the demographic shift and changing shopping habits, such as internet shopping. Some traders and retailers are anticipating these expected future developments by coming up with new shopping concepts and looking for new environments and real estate to match their requirements. They are also looking for cheaper business formulas and outlet options in view of the very high rents in major shopping streets. Municipalities face a growing demand to establish stores on business parks and industrial sites, which often have space available. Yet such a development is deemed undesirable, because it causes more shop vacancies and the risk of urban decay in city centres and shopping streets.

Province of Limburg region	Existing retail property		Planned retail property
	m^2	vacancy	m^2
Northern Limburg	511,000	10%	50-60,000
Central Limburg	502,000	9%	20-30,000
Southern Limburg	1,132,000	9%	230-300,000

Figure 28.2 Retail property in Limburg regions in 2012. The retail stock in Limburg is monitored on a yearly basis by the provincial authorities.

This state of affairs results in entirely new policy issues. Planning in an era of declining spatial requirements is not simply a matter of reversing previous growth. The challenge is to increase quality in terms of sustainability and consumer requirements without adding stocks such as houses, offices, retail properties and business estates. The challenge is to transform existing poor stock into business parks, retail areas, dwellings, and offices and to ensure that present and future needs will be met. The perspective is not one of growth and stock enlargement; it is about redesigning and reducing surplus without a clear prospect of short-term financial profit.

28.2 From planned development to co-creative path finding

In 2001, Limburg was the first Dutch province to integrate the various compulsory policy documents, such as spatial and environmental plans and plans for water management and mobility, in an integrated policy plan, the Provincial Environmental plan Limburg (PEL). This PEL argues from the perspective of integrated value creation and is based on a model of stocks and flows in the social, economic, and ecological domains. The principal idea is that growth in one domain, usually the economic domain, should not occur at the expense of the other domains; there should be balanced development.

In the past decade, the dominant policy challenge was to allocate space to all kinds of initiatives to develop sites into business or residential areas, thus adding financial value to available locations, mainly to increase investor profit. The issue here used to be "programmes looking for locations". Today, we are dealing with the opposite issue, which is "locations looking for programmes", and it is difficult to create financial value by developing a site in the traditional way (Janssen et al., 2012). In this situation, development is grinding to a halt, and instead of creating financial or public value, value is being lost.

In the present-day built environment, we are witnessing a surplus in stocks but a shortage of desired quality features. Since a high-quality built environment is considered a major factor for the residential and business climate in Limburg, a significant transformation is required. As there is no clear prospect of financial profits in the short term, traditional market parties are passive, waiting for better times to come, and this present standstill does not contribute to the desired transformation. The provincial and municipal governments are therefore exploring new ways to stimulate dynamics without adding to existing surpluses. A dynamic is required for tearing down or restructuring poor quality real estate and creating a new and different built environment. This dynamic includes the joint creation of public value as well as the distribution of short-term financial losses, and calls for creative solutions, new revenue models and financial arrangements and, as it turns out, new stakeholders and partnerships.

In this situation the old ways no longer work, neither the traditional prescriptive and regulating planning methods, nor the processes of producing (regional) development plans, nor the content of such plans, nor the institutions we know today. So there is a need for new policy approaches. For this reason, PEL2014 is not a plan based on the conception that the authorities “make” environmental quality by imposing regulations and restrictions. PEL2014 is based on the philosophy that the quality of the environment is created in day-to-day decisions by citizens, business communities, institutions, and authorities. Regional development is seen as a result of all these actors’ activities, and actors are regarded as partners.

This is why the PEL2014 integrated plan for the Limburg physical environment has been developed in a co-creative process with these various stakeholders. PEL2014 aims to provide an integrated vision of regional development and environmental and spatial quality, inviting and inspiring stakeholders to add and co-create public value. The central theme is that of improving the quality of the physical environment, thus creating the physical constituent of an excellent residential and business climate in the province of Limburg.

PEL2014 presents an integrated vision which includes problem definitions, ambitions, and challenges shared by stakeholders and local and provincial governments. It outlines a robust framework designed to meet basic needs such as housing and leisure, regional economy, work and innovation, transport and energy, food production, water supply and flood protection, biodiversity, landscape and tranquillity. The vision generates many opportunities for initiatives and autonomy for municipalities, market partners, and other stakeholders. In addition to this framework, PEL2014 articulates guiding principles for the desired regional development. These include both principles that apply to the quality of the physical environment and principles that apply to the quality of the process and decision-making. PEL2014 also provides an agenda and a process for cooperative action by partners for a joint approach to the regional issues. This joint approach also extends to the deployment of instruments.

Thus, PEL2014 is an example of “planning by invitation”, which is regarded as a new step forward in Dutch planning history.

The guiding principles are meant to guide decision making in concrete projects based on the long-term vision. Hence there are principles for the meaning and interpretation of “quality” in the physical environment and principles for governance (Province Limburg, 2014). See Box 28.1.

Box 28.1 Guiding principles for decision making

The main quality principles for the physical environment are
- real cities and real countryside, fostering variety;
- inclusive sustainability;
- trans-border (Netherlands, Belgium, Germany) daily urban systems offering opportunities;
- re-use of existing sites and buildings; and
- dynamic stock management.

Principles for governance are:
- inspire and invite;
- involve stakeholders from the start;
- involve provincial authorities selectively;
- utilise instruments in the service of the policy network;
- experiment with new practices and habits.

The main challenge on the action agenda is coping with the transition from financially driven land and property development to customer- and quality-driven restructuring of the built environment. This challenge requires joint problem framing and a shared awareness among both stakeholders and governments that development opportunities at the local level must be understood not only in financial and local terms but most importantly also in a broader regional context of service provision and sustainable levels of quality.

28.3 Dynamic stock management

In the current situation of little economic growth, market parties are not coming up with sufficient initiatives to solve the contemporary problems of decay and falling value in the built environment, accompanied by financial losses. This situation justifies public intervention. Since markets exceed municipal boundaries, regional intervention is required. PEL2014 offers the new policy concept of dynamic stock management at regional scale as a guiding principle.

The key idea in dynamic stock management is to stimulate sustainable quality by bringing about renewed market tension. This tension is to be induced by a government intervention at the regional scale level, delimiting determining the various regional stocks and formulating binding agreements on partners' joint vital interventions. Fundamental to these agreements is a clear and shared vision of the desired regional profile, based on common insights into trends and developments, and the state of present stocks of houses, offices, retail properties, industrial sites etc.

As Figure 28.3 shows, the stock is to be divided into three segments:
- existing stock (actual buildings or business sites);
- legally committed plans (stock that will be added if financially beneficial to the developer);
- legally uncommitted plans and ideas (this segment requires a procedure to become legally committed in public spatial plans. Sometimes there are contracts under private law);

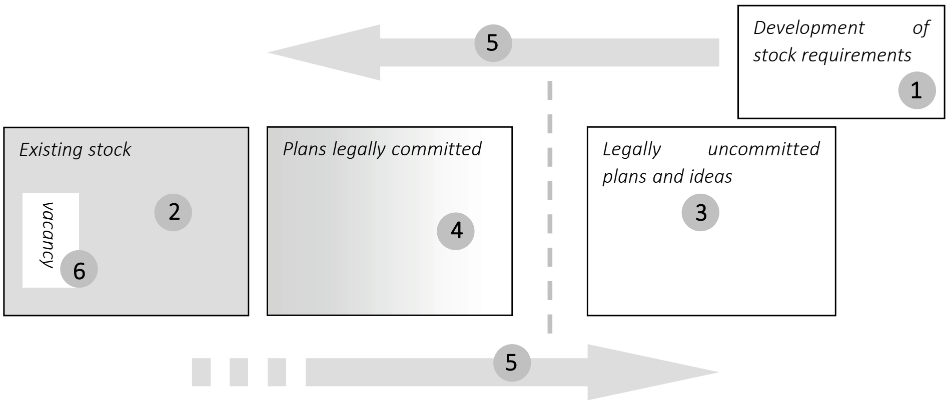

Figure 28.3 Dynamic Stock management

Possibilities for intervention:
1. attracting new companies, residents, etc.;
2. increasing quality of existing stock;
3. cancelling legally uncommitted plans and ideas or changing them to plans that add the required quality to stock;
4. changing or cancelling plans that do not serve (future) requirements;
5. adding new stock and simultaneously cancelling inadequate stock by means of legal and financial measures (balancing);
6. solving vacancy problems by re-use, repurposing or demolishing.

28.4 The next steps towards dynamic stock management

Dynamic stock management is a policy concept that provides common ground for local and regional authorities and private parties in the quest for solutions to the problems concerning the surplus of housing, retail, and other real estate and business sites. It offers a shared analysis of trends and a common problem definition which provides room for various individual interpretations. Although the problem is still rather unstructured, as different dimensions are relevant to the various stakeholders, the concept of dynamic stock management is robust enough to involve actors in a collective regional agenda.

In the co-creative process of establishing PEL2014, local authorities and stakeholders have acknowledged that they are all facing surplus problems, that these problems are not unique to municipality x or y, but that they are ubiquitous in the region and in fact in the province, and that they cannot be solved at local level. This joint understanding boosts local authorities' readiness to engage in regional cooperation.

In implementing the concept of dynamic stock management, all sorts of legal, financial, social, administrative, and political issues need to be resolved, concerning the reduction of excess planned capacity and at the same time the improvement of quality and future value. This task calls for new modes of working that are not simply the reverse of the strongly financially driven facilitation of project development in the past decades. It concerns new challenges such as doing away with excess existing stock and legally committed plans, choosing the most promising areas and plans in terms of sustainability and customer and future value, and it implies turning around or ending developments that build on the ways-that-were and do not improve public value.

The regional implementation of dynamic stock management for the various themes has been characterised as a political and joint learning process. Politicians have to choose what areas and plans add future value in the regional context, but to do so they need to be informed about options and their consequences. This requires input of knowledge from disciplines such as economics, sustainability science, law, financing, and sociology, both from experts and practitioners, and possibly from scientists, in a transdisciplinary approach (Lang et al., 2012).

Knowledge-related questions that have arisen at the start of these processes concern exact inventories of existing stocks and plans, as well as questions on urgent issues like "what does our socio-economic cost-benefit analysis look like and what would happen if we find ourselves unable to cooperate?" The stakes have proved to be high: for retail alone, an estimated value of about 1 billion euro is found to be at stake. (STEC groep, 2015)

The process will involve the development of new instruments and arrangements or new deployment of existing communicative, legal, and financial instruments, as well as a need for new institutions for dynamic stock management at the regional level, such as regional counselling structures, frameworks for binding agreements, and monitoring systems.

To deal with this type of challenge, more relational and reflexive forms of governance have been proposed (Meadowcroft, 2007; Healey, 2007; Jordan, 2008). The situation requires a process design that provides for structured evaluation and reflection on the practices, progress, cooperation, and goal achievement, as well as reflection on the ways in which the choices made are actually guided by the principles formulated in PEL2014.

In addition policymakers, professionals, municipal councils, aldermen, and municipal and provincial policy advisors have embarked on an overarching joint learning process called “Expedition on Spatial Development”, which was designed in collaboration with Wageningen University. This expedition aims to offer on-the-job learning experiences regarding the intended new approaches and working methods through inspiring knowledge inputs, venues, and discussion of real-life cases. It also aims at strengthening the networking capacity of all actors involved. In the interpretation by Jordan and Turnpenny (2015), PEL2014 can also be viewed as an experiment in applying novel sets of policy formulation tools.

Thus, PEL2014 not only provides common policies for pressing challenges in the improvement of the Limburg physical environment. It also stimulates stakeholder and (local) government cooperation in the region. Starting from the shared desire for an excellent quality of the physical environment in Limburg, and using processes of co-creative visioning, implementing a regional agenda, and proceeding along a joint learning path, new ways of working are also expected to be jointly discovered and developed. Thus by its co-creative approach, PEL2014 hopes to inspire high-quality growth, both in the physical environment and in public administration.

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Chapter 29

Urban labs – a new approach in the governance of sustainable urban development

Joop de Kraker, Ron Cörvers, Christian Scholl, Tim van Wanroij

Abstract

European cities are facing complex economic, social, and environmental challenges. Improving the governance of urban complexity and creating more sustainable, inclusive, and economically viable cities requires new approaches. A currently popular approach is that of the urban lab, in which local governments engage in a problem-solving process together with other stakeholders in urban development. However, urban policy makers and stakeholders are struggling to implement urban labs, and seek guidance for their further development. Three major questions concern (1) the types of challenges for which urban labs are most suited, (2) how urban labs can best be organised in terms of structure, process, and participation, and (3) how urban labs can best be integrated into local government structures. In this chapter, we give some preliminary answers, based on the experiences with Maastricht-LAB, an urban lab in Maastricht, The Netherlands.

29.1 Introduction

The challenges of urban governance

European cities are facing challenges of growing complexity (EU, 2011). These challenges involve economic, social, as well as environmental dimensions, and are often interrelated. Examples are: ageing populations, economic vulnerability, growing inequalities and social polarisation, congestion of transport networks, impacts of climate change, environmental pollution, and degradation of public spaces. At the same time, cities aspire to become more sustainable, inclusive, attractive, and economically competitive. To respond to these complex urban challenges, new forms of governance have been called for (KEI & NICIS, 2012). The common view is that these new forms should enable local governments to work across sectors in a participatory and flexible way, engaging citizens and utilising the cities' creative, intellectual, and social capital (EU, 2011).

The emergence of urban labs

Examples of new forms of governance that have recently gained great popularity are so-called Living Labs and City Labs. Living Labs represent an approach to user-centred innovation by engaging users actively as contributors to the creative and evaluative processes in innovation and development (Følstad et al., 2009). City Labs are arrangements in which local governments and other stakeholders jointly seek to learn about and be involved in new ways of dealing with urban challenges, by means of experimental, real-life projects. Both types of 'lab' aim to extend the networks of those actively involved in finding innovative solutions by emphasising co-creation and joint learning by multiple urban actors. Here, we use the generic term 'urban labs' to refer to City Labs and (urban) Living Labs. Urban labs appear to be a particularly promising, innovative form of governance to address complex urban challenges and create public value (EU, 2011).

Three questions about urban labs

Policy makers and other urban actors are, however, struggling with the implementation of urban labs, and seek guidance for their further development. There is as yet a lack of evidence-based guidelines and design principles concerning (1) the types of issues for which urban labs are most suited, (2) how urban labs can best be organised in terms of structure, process, and participation, and (3) how urban labs can best be combined and integrated with formal local government structures. Associated with these three central issues are a wide range of more specific research questions. For example, as regards the types of problems most suited to be dealt with in urban labs, important questions concern the determinants of problem selection and agenda setting for urban labs, and the distinguishing characteristics of problems that can be successfully addressed in these labs. As regards the "good practices" of implementing urban labs in terms of structure, processes of co-creation, and engaging participants, relevant questions are: What factors appear to determine success or failure, and how are constraints overcome? How do policymakers and other actors relate in setting and pursuing agendas? How knowledge is integrated and how diversity of values and interests is managed? The third key issue concerns the integration of urban labs as a new, innovative form of governance with the existing formal local government structures. Associated questions are: What are the intended and current roles and positions of urban labs in systems of urban governance and city development? In what ways and to what extent do urban labs constitute an institutional innovation? What institutional settings are appropriate for urban labs in the overall governance system? How can governance systems be adapted to support the sustained embedding and extension of the urban lab approach? Led by ICIS, these issues are being addressed in-depth in the European research project URB@Exp (www.urbanexp.eu) which involves action research in urban lab experiments in five European cities (Antwerp, Graz, Leoben, Maastricht, and Malmö). In this chapter, we present a preliminary exploration of the phenomenon of urban labs, guided by the three key questions.

29.2 The case of Maastricht-LAB

A promising example of a City Lab is Maastricht-LAB (M-LAB), a temporary governance platform for local experimentation and learning by doing. In this section, we describe its background, organisational design, and activities, focussing on its first phase (2012-2014). In the next section, we then present some "lessons learned" from this case in the form of preliminary answers to the three key questions about urban labs outlined above.

Background of M-LAB

Maastricht is a medium-sized Dutch city (120,000 inhabitants), capital of the Province of Limburg, and situated in the very south of the Netherlands, near the borders with Belgium and Germany. Since World War II and until recently, urban development in Maastricht was growth-driven and had become a "game of big players". The municipal authorities formed public-private partnerships with large project developers and housing corporations, to implement large-scale master plans and city development projects. However, since the start of the economic crisis in 2007, the urban planning and development landscape has changed rather dramatically, with the break-down of several large public-private partnerships as a result of both demographic and economic stagnation. To safeguard the urban quality of Maastricht in the absence of new large-scale plans and projects, the municipal authorities now want to stimulate a transition towards novel modes of urban development. Key notions in this transition are repurposing of empty buildings, small-scale incremental development, temporary use, flexibility, sustainability, co-creation, and bottom-up initiatives. A crucial exercise in this regard is to mobilise citizens and local organisations to get them to contribute to the development of Maastricht by means of concrete initiatives and projects. The municipal authorities want to accomplish this by transforming its approach towards a more demand-driven, small-scale, flexible governance system of urban development. To anticipate this major change, the city has developed a new long-term vision document for spatial planning. This vision document, the 'Structuurvisie Maastricht 2030' (Gemeente Maastricht, 2012) offers a robust framework, rather than detailed development programmes. Furthermore, the document announces "a new period of urban development" for the city of Maastricht, which requires new ways of working, co-creation, and participation by interested citizens and local organisations in urban development. The establishment of Maastricht-LAB (M-LAB) as an experimental space for new forms of urban planning was briefly announced in this policy paper and realised shortly afterwards, in 2012.

Organisation of M-LAB

M-LAB is a municipal project, but partially placed outside of the municipal government: institutionally by having an external partner as one of the two project leaders, and physically by being accommodated in a separate building. Political responsibility resides with the alderman responsible for spatial planning and environmental issues. M-LAB is a temporary governance platform with the aim of learning about new modes of urban development and thus stimulating the transition towards a different type of urban governance. The core element of M-LAB is small-scale experimentation with participatory forms and concepts of urban development and governance. In the first phase of M-LAB, which is the focus of this chapter, the organisational design consisted of four key components: a core team, a steering group called "Gideonsbende" (literally Gideon's Gang, a Dutch word for an elite taskforce), the participants in the experiments, and partners in national and Euregional networks. In 2012, the core team of M-LAB consisted of two project leaders: one from the municipal government and a local architect. The core team was completed by a policy maker in an operational role and the municipal manager of spatial planning in a more strategic role. In addition, the alderman for spatial planning was also closely involved to create the necessary political space for experimentation and innovation. The "Gideonsbende" was inspired by the concept of a "transition arena" as introduced in the Transition Management framework (Kemp, Loorbach & Rotmans, 2007). It consisted of 16 members, combining influential regime players (the "usual suspects") and emerging creative niche players. Members were selected for their visionary perspective, individual competences, and disciplinary background. They committed themselves on a voluntary basis: unpaid and in a personal capacity. During regular meetings throughout the first two years with this group of frontrunners, urban development processes were addressed at a more strategic level, and ongoing processes within the experiments were discussed. Additionally, for each experiment two members were assigned the role of “guardians”, monitoring the progress of the experiment, safeguarding its experimental character, and enriching its content or process design. Each experiment had its own network of participants who were either personally invited or selected as a result of an open invitation, depending on the specific character of the experiment. At a national level, M-LAB takes part in the City Embassies network (“Stadsambassades”) and a network of other urban labs (initiated by the Creative Industries Fund NL), bringing together frontrunners in urban transition throughout the Netherlands. Financially, M-LAB is supported primarily by the municipal government and a number of national and Euregional organisations.

Activities of M-LAB

The activities of M-LAB rest upon three pillars: experimentation through local projects (acting), the development of new coalitions (connecting), and creation of a broad knowledge infrastructure (learning). In its first two years (2012-2014), Maastricht-LAB conducted eight experiments, seven of which were initiated by the municipal authorities. Each experiment had its own challenges, complexity, and specific research questions (Box 29.1). What these have in common is a spatial focus and an innovative or experimental component which cannot be dealt with by the municipal authorities alone or within the current governance structures. In addition, they were considered typical examples of challenges that are occurring more commonly, in Maastricht or elsewhere.
The first seven experiments of M-LAB enabled the municipal government to address urgent, complex urban challenges in a more experimental way. The challenges were identified by M-LAB, but the process design and its possible outcomes were the subject of discussion and negotiation. Co-creation was the main starting point for each experiment, and was based on a process in which multiple organisations and stakeholders participated on an equal basis throughout the process. In M-LAB, co-creation has two different but related meanings. Firstly, co-creation refers to processes of transdisciplinary knowledge production. Secondly, it refers to a new form of policy making and implementation in which active citizens and shared ownership of the process are crucial elements. Learning was (and still is) an explicit goal of every activity of M-LAB. M-LAB aims for three types of learning: the creation of actionable knowledge for the urban lab projects, lessons about performing experiments, and learning in the form of reflecting on frames held by the actors. For most of the experiments, a retrospective report (“LAB-journaal”) was written describing the experiment and its process design. In these reports, research questions, motivations, participants, goals, activities, results, lessons learned, and recommendations were integrated, discussed, and evaluated with the actors involved. These reports are publicly accessible on the M-LAB website (http://www.maastrichtlab.nl/). M-LAB also initiated a temporary and

informal educational programme for new urban development: the City Academy ("Stad.Academie") with its own organisational structure and legal entity. It started in 2013 and consists of seven modules which will discuss different topics related to urban development. The goal is to jointly learn about several urban challenges from a transdisciplinary perspective. Other learning-related activities included writing blogs and columns on the M-LAB website and organising public debates, events, and symposia. Lessons emerging from the lab were disseminated through the networks of the actors involved.

Box 29.1 The experiments of Maastricht-LAB (2012-2014)

<u>EXP01: Park of the Future</u>
How should a future park be developed, in an open planning process where there is room for citizen participation and local initiatives?

<u>EXP02: New Zoning for Tapijn area</u>
What does a new zoning plan for a former military barracks site look like, considering that the redevelopment phase will last at least 10-15 years?

<u>EXP03: Old fire-station</u>
How can an old inner city fire station be transformed into a public and business site, based on a process of co-creation with possible end users?

<u>EXP04: Repurposing large monumental buildings</u>
How can large monumental buildings be repurposed, in a more open governance approach involving stakeholders and market parties?

<u>EXP05: Long-term vacant property</u>
How should the city deal with an abundance of long-term vacant property, in a societal context where supply exceeds demand?

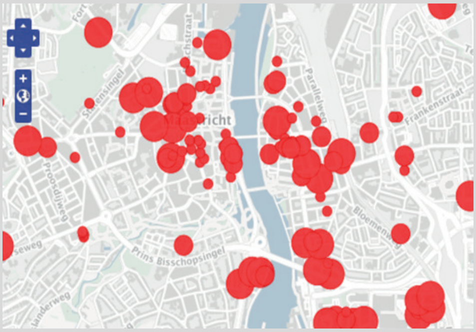
<u>EXP06: High street</u>
How can the high street be redeveloped, together with property owners, shopkeepers, inner city management and the municipal government?

<u>EXP07: Sustainable energy</u>
How can a local high school building be made more sustainable and CO_2-neutral, in terms of energy use, education, and community building?

<u>EXP08: Open Call</u>
What concrete ideas and projects do local citizens and organisations have which can contribute to the development of the city?

Box 29.2 Tackling the problem of vacant real estate in Maastricht

A priority area of M-LAB is to develop innovative solutions for empty buildings in the city. Vacant real estate has become a structural problem in Maastricht (and many other cities) and is not limited to just shops and offices, but also relates to a large number of historical buildings which determine the appearance of the city.



Maastricht map: web based interactive map indicating vacant real estate in the (inner) city of Maastricht

Sphinx building: former industrial building, currently under renovation for student hotel

Tapijnkazerne: former military complex, now partially in use by Maastricht University

De Brandweer: former fire station, now it is a multifunctional building for start-ups, offices, a restaurant and meeting place for social events

Sources: Maastricht map, website M-LAB. Pictures buildings, Ron Cörvers.

M-LAB Next

In 2014, a new phase of M-LAB started: M-LAB Next. The major difference with the first phase is a new mode of operation. Instead of taking an initiating role, M-LAB now wants to cooperate as a partner with project initiators. Citizens and local (professional) organisations can submit project ideas through a permanent open call. These ideas should meet four criteria, with respect to:

1. content: the project should be innovative and contribute to a new form of urban development;
2. value: the project should result in value creation in the broad sense (economic, spatial, social);
3. exemplary nature: the project should be an example for the city and transferable to other sites in the city;
4. project owner: the initiator must be able to carry the final responsibility for the project.

The shift from initiator to partner and facilitator meant that the governance structure of M-LAB has been adapted. The “Gideonsbende” has been replaced by a new open network supporting M-LAB, called “Stadmakers Maastricht” (Maastricht Citymakers). The Stadmakers comprise citizens and professionals willing to spend time, effort, and money in initiating or advising on new projects. More civil servants of the municipal government will be involved more closely than before in the various projects, as civil servants (instead of M-LAB staff) will act as the first contact person or “project ambassador” within the municipal government.

29.3 Lessons learned about urban labs

When reflecting on the experiences gained with M-LAB to give preliminary answers to the three key questions about urban labs, one quickly realises that these questions are closely interconnected and that it is almost impossible to answer them separately. The challenges for which an urban lab is most suited strongly depend on the way the lab is organised, and how the lab can best be organised depends on the challenges it is meant to address. M-LAB in its first phase was well suited to address urgent challenges requiring a flexible governance approach, but not very well suited to experiment with a governance approach in which citizens are the prime initiators. To take on this challenge in M-LAB Next, a change in the organisational structure was deemed necessary. The answer to the third question, how urban labs can best be integrated into local government, also depends strongly both on the challenges the lab is intended to address and on the way it is organised. In the case of M-LAB, for example, the answer to this question will be determined by its aim to stimulate a transition in the governance of urban development and its corresponding temporary nature. Therefore, although we here briefly present some generalised “lessons learned” about urban labs, one should bear in mind that the three questions addressed are closely interconnected.

Challenges for which urban labs are most suited

M-LAB in both its phases has made it clear that an urban lab is well suited to explore new ways of governance in a changing urban development landscape. By conducting experiments on small scales (in terms of spatial extent, duration, budget, and number of people involved), new approaches can be tested without major consequences in case of failure. Combined with a strong focus on learning, the experiments provide a rich source of knowledge about what works and what does not. What remains unclear, however, is to what extent the approaches thus tested can be extrapolated to large-scale, more complex challenges.

How urban labs can best be organised

Given their focus on participation, co-creation, and experimentation, urban labs on the one hand need to be open to citizens and other urban stakeholders, and on the other hand require political backing and support from the administration. The design of M-LAB as a boundary organisation (Hoppe, 2005), partly inside, though not embedded in the sectoral structure of the municipal government, and partly outside of the municipal government, appears to meet both requirements rather well. Furthermore, the open call mechanism in M-LAB Next seems an effective way of transferring the initiative to the citizens and engaging the city’s creative and social capital. Whether this will also combine well with the aim of broad co-creation in problem-solving remains to be seen, as the open call may particularly attract people who have strong convictions about specific solutions, which may hamper the involvement of other stakeholders with different perspectives and the development of a broadly shared view on the problem and a wide range of alternative solutions.

How urban labs can best be integrated into local government

It is almost impossible to make general statements concerning the embedding or integration of urban labs into local government. Even in the specific context in which M-LAB was established, i.e., a changing urban development landscape as a consequence of demographic and economic stagnation, different approaches would have been possible, depending on how the developments are interpreted. For example, M-LAB could have been given a permanent niche position in the municipal government to address relatively difficult but small-scale problems, such as the repurposing of vacant real estate. Or, in case the need for a change in governance is seen as temporary, the existence of M-LAB could have been made contingent upon the continuation or ending of the economic and real estate crisis in Maastricht. In contrast, change, and the need to adapt governance in response, can also be viewed as permanent, requiring M-LAB to be a permanent incubator and testing ground for new ideas. M-LAB is founded on the view that the changes in the urban development context are fundamental and irreversible. As a consequence, M-LAB is seen as a temporary construction, which can be dismantled after a new approach to governance has been developed, tested, and embedded. This temporary nature is combined with a structured approach to learning and disseminating lessons, both in an informal way (involving civil servants and urban stakeholders in the experiments) and in a formal way (Stad.Academie). This appears to work well, although it is questionable whether the current scale and available time is not too limited to achieve the ambitious goal of a substantial transition in urban governance.

29.4 Outlook

Reflection on the experiences with M-LAB has not only led to the insight that the three original questions are closely interconnected, but has also raised new questions about the case of M-LAB, and about urban labs and urban governance in general. We conclude this chapter by presenting the more fundamental ones :

- Are urban labs – including their emphasis on active citizen participation – primarily a governance response to challenges and opportunities caused by the current economic crisis, which are mainly temporary in nature, or are they a response to fundamental and irreversible changes in society?
- Can the small-scale, flexible, participatory governance approaches developed in urban labs effectively address large-scale, highly complex issues, either by upscaling or by tackling large problems with many small-scale, bottom-up initiatives?
- To what extent can the governance of public interests, such as urban quality and sustainable development, be handed over to private actors (citizens, local organisations, business, etc.), who are by definition driven by private, material or immaterial, interests?

A major lesson we have learned from the M-LAB case is that we first need to think about these more fundamental questions before we can effectively address the three questions about urban labs asked at the beginning of this chapter.

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Chapter 30

Sustainability Assessment

Joop de Kraker and Marc Dijk

Abstract

Sustainability Assessment (SA) can be defined as "a structured process, dealing with a sustainability issue, using knowledge from various scientific disciplines and/or stakeholders, such that integrated insights are made available to decision makers." How the SA process can best be structured depends on the nature of the problem addressed. Sustainability issues are routinely referred to as complex, wicked, unstructured problems, often without further specification. A closer look at the typologies of wicked and unstructured problems makes it clear that problem structuring is an essential first step in dealing with complex sustainability issues. Important dimensions to address in problem structuring are knowledge uncertainties and normative disagreements concerning the problem and its possible solutions. A participatory and iterative learning approach appears to be the most appropriate way to structure problems. It is from this perspective that we discuss SA approaches developed at ICIS.

1 Introduction

Sustainability Assessment (SA) is increasingly considered an important tool to support decision making on issues of sustainable development. Bond et al. (2012) even spoke of a “dramatic increase in the practice of sustainability assessment in many countries”, and observed an exponential growth in the number of papers published on the topic. Looking at the large variety of activities currently labelled as SA, it becomes clear that there is no clear-cut and universally accepted definition of the concept of SA. However, the commonality is that the term “assessment” is used to indicate that (scientific) knowledge is generated with the explicit intention to support policy and decision making for sustainable development. Assessment is therefore distinguished from research by its purpose: to inform policy and decision making, rather than to advance scientific knowledge for its own sake (Hettelingh et al., 2009).

SA can be seen as a marriage between environmental assessment and sustainable development (Gibson 2005). In SA thinking and methodologies, a broad distinction can be made between approaches that developed from the well-established practice of Environmental Impact Assessment (EIA) and approaches rooted in the more academic practice of Integrated Assessment (IA) of complex environmental problems. Both types of approach developed more or less simultaneously and share a focus on comprehensive assessment in the context of public policy and decision making. Thinking at ICIS is rooted in Integrated Assessment, and SA is therefore addressed as a special form of Integrated Assessment, applied to sustainability issues. Following Rotmans’ (1998) definition of IA, SA could thus be defined as “a structured process, dealing with a sustainability issue, using knowledge from various scientific disciplines and/or stakeholders, such that integrated insights are made available to decision makers.”

The question now is: how can the process of SA best be structured? What are important steps to include and in what order? Our answer is: this depends on the type of problem one is dealing with. The nature of the problem will determine which problem-solving approach is appropriate and which ones are not. Sustainability issues are routinely referred to as complex, wicked, unstructured problems, often without making a distinction between these terms. In this chapter, we first revisit the source publications of these problem typologies and consider the typical problem characteristics, and then discuss how these are addressed in the SA approaches developed at ICIS.

2 Problem types

The "discovery" of wicked problems

In December 1969, at the very end of one of the most turbulent decades in the country's history, the American Association for the Advancement of Science organised a "Panel on the Policy Sciences" in Boston. One of the papers that were presented there has become a classic: "Dilemmas in a general theory of planning." By now the paper has been cited in almost 9,000 scientific publications. Perhaps as a mark of originality, the paper itself contains no more than four references. In this paper, the authors Horst Rittel, professor of design science, and Melvin Webber, professor of urban planning, reflected on societal developments over the past 10 years and introduced the concept of "wicked problems." They observed that the start of the decade was marked by the publication of "Goals for Americans", the report by President Eisenhower's Commission on National Goals, and concluded that despite the initial optimism, goal-finding had turned out to be "an extraordinarily obstinate task" (Rittel & Webber, 1973). During the decade that followed, the supposedly nationally shared goals for the American society were attacked by "the revolt of the blacks, then by the revolt of the students, then by the widespread revolt against the war, and more recently by new consumerism and conservationism." Rittel and Webber concluded that in 1969, America had become a pluralistic society where "there is nothing like the undisputable public good." They then continued to address another development, the increasing connectedness of societal sub-systems into complex, "large networks of systems, such that outputs from one become inputs to others", the consequence being that an intervention at one location in the network generates "waves of repercussions."

For planners dealing with societal problems, these two developments create major difficulties in defining problems and developing solutions. Due to the plurality of society, it is no longer clear what the desired situation looks like and what measures should be taken to achieve this. The complexity of society has made it very difficult to determine the causal structure of a problem and to predict the effects of an intervention. This led the authors to conclude that societal planning problems have become inherently "wicked". They used the term wicked not in a moral sense, but in a sense comparable to "vicious" in "vicious circle". In other words, a "wicked problem" is a problem that is very hard to deal with, a problem "resisting" solution. This contrasts with a "tame problem", which is easily defined within known categories and for which tried and tested solutions or problem-solving procedures are available, even though it may be technically very challenging (Figure 30.1). A large part of Rittel and Webber's paper was dedicated to presenting ten defining properties of wicked problems, which make it indisputably clear that wicked problems are very wicked indeed, and, worse, that nowadays all major societal problems are wicked problems. In summary, wicked problems can be defined and explained in numerous ways, are unique and connected to other problems, and do not have a single, objectively best, definitive solution or a well-described procedure to find a limited set of potential solutions.

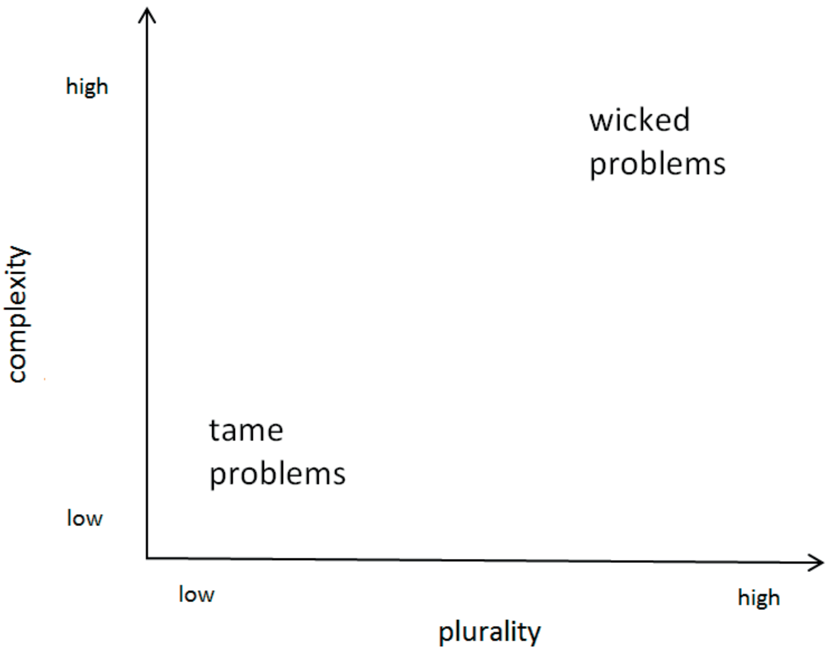

Figure 30.1 Problem types according to Rittel and Webber (1973) as a function of societal plurality and complexity

Obviously, this startling set of properties implies that wicked problems cannot be addressed in the same way as tame problems without running into trouble. If the wicked nature of a problem is ignored, attempts to solve it as a tame problem may result in even more serious problems emerging somewhere else or vehement societal protests against the planned solutions. According to Rittel and Webber, dealing with wicked problems differs from solving tame problems in two major ways. The first concerns a shift in focus from finding the optimal solution to understanding and formulating the problem, the second involves a shift from a linear to an iterative approach. The formulation of a wicked problem *is* the problem. Moreover, defining the problem *is* defining the solution, because every specification of the problem is a specification of the direction in which the solution is to be sought. This means that in the case of wicked problems, a lot of time should be spent on formulating the problem, and that this phase of the problem-solving process must be revisited several times, as the assessment of proposed solutions will lead to a better, more complete understanding of the problem. In this context, the authors concluded that "the famed systems approach" will not work for wicked problems, as it is a linear approach organised into distinct phases, from defining the problem to implementing the preferred solution. They therefore proposed a "second generation" systems approach, which "should be based on a model of planning as an argumentative process, in the course of which an image of the problem and of the solution emerges gradually among the participants, as a product of incessant judgment, subjected to critical argument."

The paper by Rittel and Webber spurred the development of methods and tools that focus on qualitative systems analysis and problem structuring, often involving multiple stakeholders, rather than on finding the optimal solution (Rosenhead, 2013). Some of the current tools are even based on a discussion-support system developed by Rittel himself in the early 1970s: IBIS, the Issue Based Information System (Conklin, 2003). These problem-structuring methods help to address wicked problems by explicating alternative perspectives and formulations, assisting argumentation, promoting negotiation, and generating mutual and eventually shared understanding. Problem-structuring methods are also known as soft systems approaches, as opposed to hard systems analysis, in the sense that high-tech computer models are replaced by low-tech graphical representations, and algorithms and modellers are replaced by discussions and facilitators, probabilities by possibilities and forecasts by alternative scenarios.

The "discovery" of unstructured problems

In our introduction, as in many publications, sustainability issues were referred to as "wicked", "unstructured" problems, suggesting that both terms are synonymous. However, this is not the case, although both problem typologies (tame/wicked, structured/unstructured) are rooted in the growing complexity and diversity of society. The concept of unstructured problems was developed, long after Rittel and Webber's publication, by the Dutch political scientists Matthijs Hisschemöller and Rob Hoppe in their paper on "Coping with intractable controversies: The case for problem structuring in policy design and analysis" (1995). As the title suggests, the authors were interested in the phenomenon of "intractable controversies", a term derived from Schön and Rein's work on "frame reflection" (1994) and referring to a situation of political deadlock over a controversial policy issue. Based on studies of the siting of hazardous facilities, Hisschemöller and Hoppe argued that intractable policy controversies arise when policy makers treat unstructured problems as if they were structured. To make this case, the authors first defined four types of policy problems, a policy problem being a "gap between the existing and a normatively valued situation that is to be bridged by government action." Their problem typology is defined by two dimensions: the degree of consensus about relevant norms and values concerning the goals or ends, and the degree of consensus about relevant kinds of knowledge concerning the solution or means (Figure 30.2). In other words, in case of widespread discomfort with the status quo, is there agreement about the desired situation as well as agreement about the way to get there? Presented in this way, the "(dis)agreement on ends versus (dis)agreement on means" typology of unstructured problems is clearly distinct from the "plurality versus complexity" typology of wicked problems. Yet, they are closely interrelated, which, combined with the far from consistent and often confusing terminology used by Hisschemöller and Hoppe, is probably why both typologies have often been perceived as one and the same. Lack of consensus about ends or means is directly associated with the plurality of values and interests in today's society, whereas disagreement and uncertainty about the kinds of knowledge that are relevant to the solution of a problem will at least in part be caused by the growing complexity of problems.

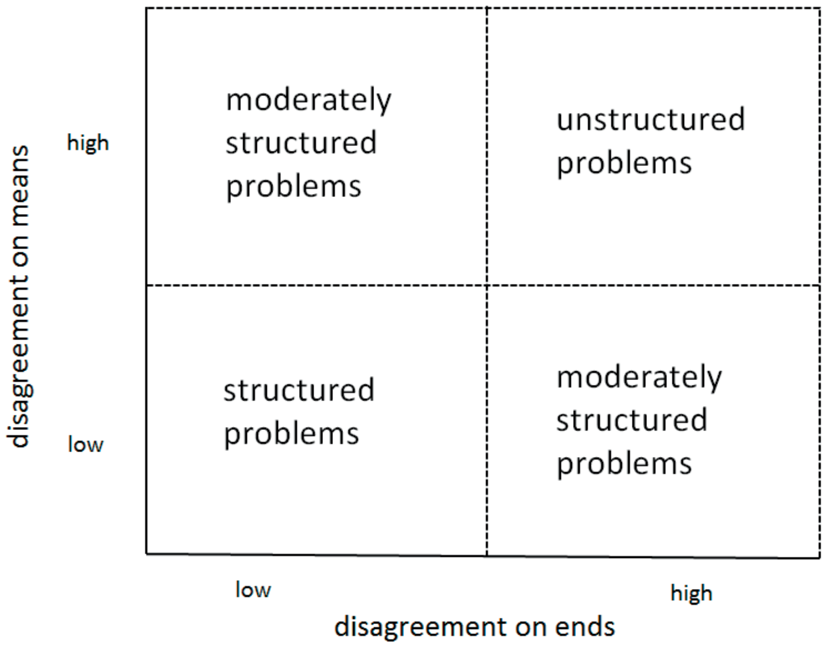

Figure 30.2 Problem types according to Hisschemöller and Hoppe (1995) as a function of disagreement on ends (values) and means (knowledge, expertise)

As mentioned above, their typology of policy problems was not a goal in itself for Hisschemöller and Hoppe, but a means to understand how intractable controversies arise and how they could be coped with. As the authors observed, decision and policy makers prefer to deal with structured problems, problem situations in which there is no debate about the goals and for which standardised procedures and clearly defined expert knowledge can be invoked. In such situations, it is possible to move straight from problem recognition to resolution, which saves a lot of time and trouble. As a consequence, policy makers tend to see structured problems even where the problems are of an unstructured nature. Consciously or unconsciously, they "structure" these problems by predefining the relevant values and expertise and by excluding stakeholders with diverging views. When these stakeholders start to protest and fight for a place at the table for their values or expertise, the controversy is born, and it will

be intractable as long as the policy makers try to deal with it as an already structured problem.
Fortunately, there may be a way to deal with unstructured policy problems without ending up in an intractable controversy. In their paper, Hisschemöller and Hoppe presented the so-called “learning” strategy for structuring unstructured problems. In this strategy, a group of stakeholders is gathered, as diverse as the problem requires, who are allowed to introduce as much diverging knowledge and information about the problem as possible. In rounds of debate, the participants become aware of the many aspects of the problem by argument and counter-argument. This interaction enables them to reframe their conception of the problem, and renders them capable of developing new perspectives on the problem and discover new opportunities to solve it. The new views of the participating policy makers incorporate elements from stakeholders’ diverging views which were first excluded.

3 Addressing wicked and unstructured sustainability problems

From IA to ISA

ICIS was founded in 1998 as an institute devoted to “integrated assessment” (IA). Founding father Jan Rotmans described IA as “a structured process of dealing with complex issues, using knowledge from various scientific disciplines and/or stakeholders, such that integrated insights are made available to decision makers” (Rotmans, 1998). One might expect that in this context there would be a strong interest in the problem typologies discussed above, and in particular in the methods and tools proposed to address wicked and unstructured problems. However, Rotmans’ seminal paper “Methods for IA: The challenges and opportunities ahead” (1998), only mentioned “complex problems”, without further definition. Yet, eight years later, in what can be seen as an update of the 1998 paper, Rotmans (2006) referred to wicked problems when explaining the kind of issues addressed by so-called “integrated sustainability assessment” (ISA): “We call these problems persistent problems, an even higher grade of complex problems than what Rittel and Webber called wicked problems.” The author did not explain what makes persistent problems even more complex than wicked problems, but it may have to do with the scale of the issues addressed. Whereas Rittel and Webber, focusing on urban planning, mentioned the location of a freeway and street criminality as examples of wicked problems, Rotmans sought to address the unsustainable structure of entire international sectors, such as agriculture and the energy system.

Interestingly, Rotmans devoted much attention to the enormous complexity of persistent problems, involving many stakeholders and being surrounded by structural uncertainties and the corresponding tremendous challenge in correcting these “system failures." In contrast, the dimension of plurality, which is key in both wicked and unstructured problem types, was only briefly referred to in his lengthy paper when discussing the next generation of ISA tools, stating that these should be interactive, "realising that multiple stakeholders perceive a problem from different perspectives."

Nevertheless, the development from IA to ISA is characterised by the same elements as the proposals by Rittel and Webber and Hisschemöller and Hoppe for dealing with wicked and unstructured problems. These concern: a shift from a linear to an iterative, cyclical process; a shift from a focus on integration of scientific disciplines to inclusion of stakeholder knowledge and perspectives; and a new, strong emphasis on learning. Moreover, in contrast to previously institutionalised EIA types of sustainability assessment, ISA devotes considerable attention to problem structuring. The ISA approach consists of a cycle of four phases (scoping, envisioning, experimenting and learning) and should be conducted as a participatory process including scientists, policy makers and societal stakeholders. The phase of scoping involves defining and contextualising the problem, and is followed by the phase of envisioning, which aims to arrive at shared understanding and common goals. These two phases can be seen as problem structuring. In the experimentation phase, potential solutions are tested and in the learning phase, the preceding phases are evaluated and lessons are drawn. Depending on the outcome, a new cycle of scoping, envisioning, experimenting and learning could start, in which the problem definition and goals may be redefined and new solutions can be tested, and so forth. ISA can thus be seen as a continuous, progressive, multi-stakeholder process of learning about a sustainability problem and about ways to address it. A more elaborate presentation and discussion of ISA can be found in Chapter 31 of this book.

From ISA to SA

On paper, ISA is the perfect approach to deal with wicked, unstructured sustainability problems, but practical examples are hard to find. The main reasons for this gap between theory and practice are the lack of readily applicable ISA tools and methods and the mismatch between the open-ended cyclical nature of ISA and the linear, time-bound and resource-limited setting of projects and more formal, institutionalised applications. This means that teaching ISA as the way to conduct sustainability assessment is not a good idea if you want your students to acquire competences useful for sustainability practitioners. In that case, they would require tried and tested methods and tools and an assessment approach that is applicable in their future job situations. In ICIS' Master of Sustainability Science & Policy programme, we have combined theory and real-life applications of sustainability assessment methodology to force ourselves to develop an approach to SA that could be successfully implemented in the context of an externally commissioned four-week Sustainability Assessment Project. The continued interaction between theory and application has resulted in an approach that is – compared to ISA – more linear, more focused on initiating than achieving transformation, and targeted at smaller spatial scales. What has remained are the four phases of the assessment process, now with generic labels following De Ridder et al. (2007), an emphasis on problem structuring and learning, and – perhaps even more so than in ISA – attention for the plurality of stakeholder perspectives. Table 30.1 gives an overview of the methods that have proved to be useful in a wide range of student-conducted SA projects, for each phase.

Conceptually guiding this SA methodology is a problem typology based on a combination of Rittel and Webber (1973) and Hisschemöller and Hoppe (1995). In this typology, problems are characterised along two dimensions: disagreement on values and uncertainty in knowledge. Values and knowledge apply to both the problem and the solution. Problems characterised by high levels of normative disagreement between stakeholders and uncertainty in the knowledge about the nature of the problem and how to solve it, are called "unstructured problems", to indicate that problem structuring is required before known problem-handling or decision-making procedures can be applied. SA is then conceived as primarily a problem-structuring approach, aiming to explicate and reduce normative disagreement and knowledge uncertainty, to the extent that the problem becomes (politically) manageable[59] (Figure 30.3). This requires a balancing act in both dimensions, as the history of SA shows that assessments often focus on either reducing knowledge uncertainty, e.g. by applying complex quantitative computer models, or on reducing normative disagreement, e.g. by organising stakeholder dialogues (Dijk et al., 2016). This results in problems that are only half-structured, and, as indicated above, treating such problems as if they were structured may lead to even greater problems. In our approach to SA, we try to achieve a balance in problem structuring by alternating the use of analytical methods aiming to reduce uncertainty and participatory methods aiming to include stakeholder perspectives, or, ideally, by integrating both types of methods, i.e., applying analytical methods in a participatory and more qualitative manner (e.g., De Kraker et al., 2011). Clients who commissioned student SA projects from ICIS have valued the approach in particular for three aspects, which are usually new to them: the explication of stakeholder perspectives, the integration of knowledge from a variety of disciplines and the exploration of long-term developments and associated uncertainties.

[59] "Uncertainty cannot always be reduced and consensus cannot always be reached; the problem analysis process should at least result in acknowledging and understanding the uncertainty and the dissent." (De Ridder et al., 2007)

Table 30.1 Methods used in Sustainability Assessment projects, for each assessment phase

Phase	Methods	Usefulness
Defining the problem	Systems analysis and modelling, qualitative	+++
	Stakeholder/actor analysis	+++
	Participatory methods*	+++
	Scenario analysis	+
Identifying possible solutions	Participatory methods*	++
	Systems analysis and modelling, qualitative	++
	Brainstorming methods**	++
	Scenario analysis	+
Assessing possible solutions	Multi-criteria analysis ***	+++
	Scenario analysis	+++
	Participatory methods*	++
	Systems analysis and modelling, quantitative	+
Monitoring, evaluation & learning	Group reflection	+++
	Participatory methods*	+

* Methods to explicate stakeholder perspectives on the problem, possible solutions and assessment process, e.g. through group discussions, interviews or questionnaires
** Methods using creative group processes to identify possible solutions, e.g., through brainstorming, brainwriting, brainsketching or mind mapping
*** Comparative assessment methods such as Life Cycle Analysis and Cost-Benefit Analysis may be applied to feed the Multi-Criteria Analysis

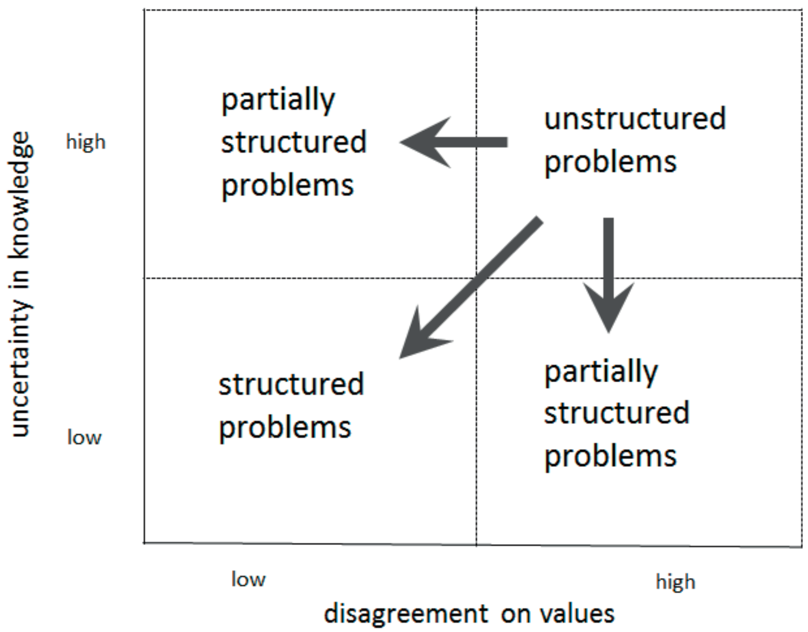

Figure 30.3 Problem types as a function of normative disagreement and knowledge uncertainty, and three ways of problem structuring (arrows)

4 Conclusion

The work on problem types by Rittel and Webber (1973) and Hisschemöller and Hoppe (1995) has made it clear that problem structuring is an essential first step in dealing with complex sustainability issues. Important dimensions to address in problem structuring are knowledge uncertainties and normative disagreements concerning the problem and its possible solutions. A participatory and iterative learning approach appears to be the most appropriate way to structure problems. ISA, an approach to sustainability assessment developed at ICIS in the early 2000s, integrates these elements but is hard to implement in practice. A more pragmatic approach to SA, taught in ICIS' Master of Sustainability Science and Policy programme, has proved to be practical and particularly effective as a method to structure problems, but in this respect also to be in need of follow-up towards policy and decision making. Opportunities for further development of the SA methodology may therefore lie in connecting our current approach to SA with other methodologies which provide a framework for the necessary follow-up, and also to allow more space for learning. Promising in this regard has been a recent experience, in which students conducted a Sustainability Assessment Project as a first step in a transdisciplinary action research project, which combined small-scale experimentation and learning. In fact, this "blend" captures the essence of the ISA approach.

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Chapter 31

Integrated Sustainability Assessment: an update on latest developments

Paul Weaver

Abstract

The chapter describes the framework and approach of Integrated Sustainability Assessment (ISA) as proposed in the three-year long MATISSE project, which ended in 2008. An update on ISA and its use is offered covering the period since the project ended. The objective is to highlight that the ISA framework provides a coherent approach that is capable of structuring effective sustainability assessment processes in a wide range of contexts and supporting programmes of implementation. Its capacity to bridge between top-down and bottom-up initiatives and to work towards harmony between them is receiving increasing and wide recognition. The chapter highlights the growing role and influence of ISA in relation to global scale sustainability challenges.

31.1 Introduction

The MATISSE project – Methods and Tools for Integrated Sustainability Assessment – represented an innovative approach to developing methods for non-deterministic prospective sustainability analysis, proposing a constructive form of sustainability assessment as a complement to evaluative forms. The project was motivated by the desire concern to support the European Commission Impact Assessment (EC IA) procedure, which had been reviewed independently by consultants during its first years of operation (2003- 2008) as well as in the MATISSE project, and found then to take place “too late” in the policy development process and to have an “end of the policy pipeline” character. Concerns identical to those raised in the Matisse project were still being raised by the Commission’s own Impact Assessment Board in respect of Impact Assessments made in 2012 (European Commission, 2013), corroborating the MATISSE critique and suggesting that, several years on, Commission IA could still benefit from taking up some of the MATISSE recommendations.

The contribution of the MATISSE project nevertheless has a wider significance than EC IA, and the approaches developed in the project are applicable to policy and decision making contexts across a broad spectrum from the strategic level to more mundane operational levels in both formal and informal contexts.

It was argued in the MATISSE project that to secure more sustainable development it is not sufficient to screen strategies, policies and decisions for their prospective impacts after these have been tabled. Rather, a more constructive form of sustainability assessment is needed as a complement to screening assessments to help integrate sustainability considerations into the design of strategies, policies, and decisions from the start. Furthermore, under conditions of uncertainty, the overall process of designing and implementing interventions should be seen as continuous and interactive. The process is more usefully conceptualised as one of adaptive management, in which policies and decisions take on qualities as experiments to be monitored and learned from, rather than as a process that assumes outcomes will be as they have been projected. Thus the approach that the MATISSE project developed, Integrated Sustainability Assessment (ISA), can be used to support sustainability reporting processes (i.e. as an accompaniment to implementation processes) as well as to support the design of interventions.

ISA is well documented (Weaver and Rotmans, 2006; Jäger et al., 2008; Rotmans et al., 2008) as an innovative approach to sustainability assessment that differs from more formally institutionalised assessment procedures embedded in established policy processes. ISA is more a process designed to support stakeholders as they seek ways to address problems of unsustainability in their implementation context. ISA is therefore action-focused and is potentially a complement to more formalised and institutionalised assessment procedures. The present paper, therefore, is less concerned to reflect on differences between ISA and other assessment modes, and instead seeks only to describe the overarching conceptual and methodological framework of the ISA approach. The objective is more to show that the ISA framework offers a coherent approach to sustainability assessment that is capable of structuring and supporting effective sustainability assessment processes that can support implementation in a wide range of contexts, and that can cut across and bridge different scale levels.

The ISA framework is described briefly in section 31.2. Recent developments in how ISA is being used are outlined in section 31.3. The concluding section 31.4 comments on the role of ISA in supporting global scale sustainability as an assessment-supported bottom-up process.

31.2 The ISA framework and approach

As proposed and defined within the MATISSE project as a form of sustainability assessment fit for constructive purposes (see Figure 31.1), ISA is defined as "a cyclical, participatory process of scoping, envisioning, experimenting, and learning through which a shared interpretation of sustainability for a specific context is developed and applied in an integrated manner in order to explore solutions to persistent problems of unsustainable development." (Weaver and Rotmans, 2006; Weaver *et al.*; 2008; Weaver and Jordan, 2008).

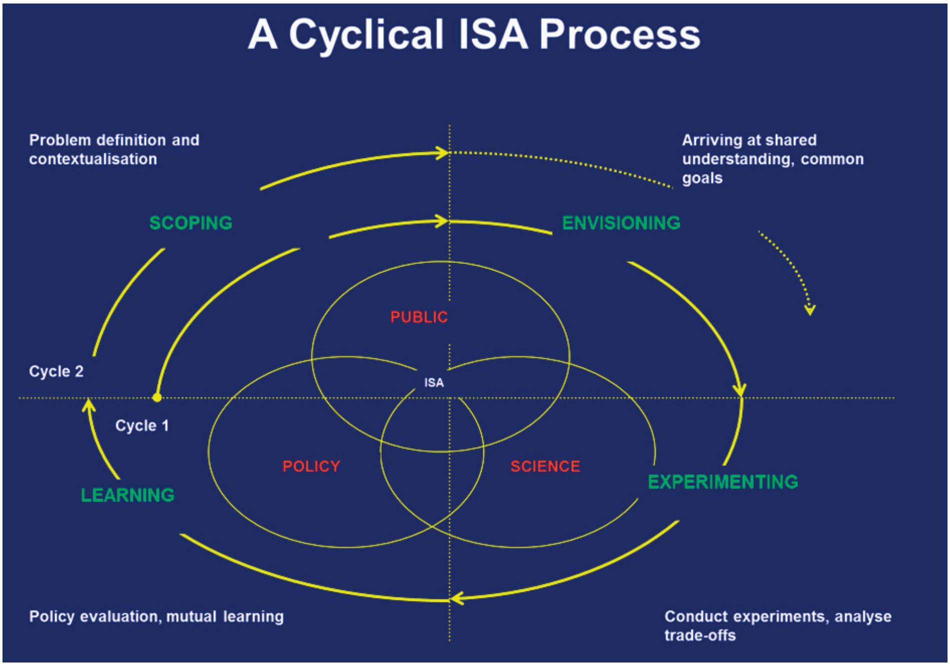

Figure 31.1 A Cyclical Integrated Sustainability Assessment Process (Source: Weaver and Rotmans 2006; Weaver et al., 2008; Weaver and Jordan, 2008)

Methodologically, ISA combines three elements: an integrated systems analysis, which seeks to secure a broad scope for the assessment; a multi-level and agent-based analytical approach, which seeks to understand multi-level processes that could lead to structural change; and a cyclical participatory process architecture, which seeks to promote social learning among stakeholders through dialogue, experimentation, and capacity building. To handle the complexity of sustainable development, ISA employs scale- and domain-transcending exceeding concepts, such as stocks, flows, and agents, and uses multiple time horizons that may extend over generations. ISA, therefore, has a cognitive dimension, a process dimension, and an analytical dimension (Weaver et al., 2008). It brings together an integrated systems analysis and a participatory process involving a selection of relevant stakeholders and actors. The integration of stakeholders selected to represent different perspectives and interests is a basic requirement of ISA to develop a rich and robust interpretation of sustainability for a specific context, including what is at "stake" and what it is that stakeholders seek to "sustain". The cognitive, analytical, and process dimensions are integrated within the assessment to deliver outcomes at the end of each stage or iteration of the ISA cycle, such as context-specific interpretations of sustainable development, visions of desirable futures, scenarios, and strategies for approaching problems and their solution. This includes the possibility of using ISA to help set voluntary limits and thresholds.

The elements and stages of the ISA cycle (scoping, visioning, experimenting, and learning) are, therefore, very different from those of traditional policy assessment as regards the purpose of stakeholder participation and the approach to engaging stakeholders in the assessment. The more open and informal the ISA process, the more likely it is that participants will be able to engage creatively with it, since this frees them from the usual institutional constraints that bind them to conventional approaches and interests. The iterative cycle is used here for heuristic purposes (see: Tuinstra et al., 2008).

ISA calls for broad participation of stakeholders in the initial scoping and envisioning stages to provide a diversity of perspectives on problem causes and solutions, and to identify niche development approaches that may be more sustainable than currently dominant approaches and that might be up-scaled (and potentially empower their associated agents and stakeholders). However, in later stages of the cycle, it calls for more limited and selective participation of those with agency. This focus on agents and agency is needed for understanding relationships among agents and modes of interaction, which are important for stimulating and steering prospective transitions. The learning stage of an ISA assessment and subsequent iterations of an ISA cycle may evolve through the reframing process as key stakeholders and those with agency redefine the issues, their own understandings of theirs and others' self-interests and roles, and the possibilities for establishing new development and policy paradigms that widen the opportunities for problem-solving.

The analytical dimensions of ISA are similarly characterised by concern for understanding multi-level processes that might lead to transition, and how these might be influenced. ISA requires modulation between scales and levels within a single sustainability assessment process. A transition approach also requires an approach to analysis and experimentation that is vision-led, pathway-driven, and process-focused. In practical terms, this requires models and approaches able to analyse and explore structural and institutional changes, multi-level change processes, supply-side constraints and demand-side management, behavioural differences *and* changes of behaviour, non-linear phenomena, and uncertainty and its different sources.

Since the perspectives and values of stakeholders are critical for scoping problems of unsustainable development, for developing a sustainability vision, and for collecting a wide set of ideas about solution possibilities, ISA combines an "in context" participative process that engages stakeholders with an analysis that uses tools designed to support and integrate social learning. Rather than assume conformist and "rational" economic behaviour, the modelling tools seek, for example, to represent a range of different behaviours, including anticipatory and learning behaviours that accommodate the possibility that stakeholders' behaviours will change as an outcome, inter alia, of their interactions. This contributes to the innovative nature of ISA. Jäger et al. (2008) describe and report on agent-based models developed in the MATISSE project, for example for exploring sustainability transition in the transport sector.

31.3 Recognition for ISA and ISA uptake

ICIS was a major contributor to MATISSE. The scientific coordinator of the project, Jan Rotmans, was based at ICIS when the project proposal was developed and submitted, and several members of ICIS staff contributed to the instigation and conduct of the project, including Pim Martens. The present author – now also an ICIS staff member – was also a party to the consortium as a member of the core management team and as leader of the work strand devoted to developing the conceptual, theoretical, and methodological foundations of (ISA). The author also guided and monitored experiments with the ISA concepts and methods in a set of case studies.

Upon its completion, the independent evaluators of the MATISSE project unanimously rated the project as excellent. The MATISSE project has since been recognised as among the most successful of the Framework Programme projects in its domain. The ISA method has gone on to be used as the methodological framework for many other projects, especially projects of action research in the domain of sustainable development, such as the "In-Context" project. The project also provided the methodological underpinnings of the recently completed VISION RD4SD project that engaged those in the science policy, science funding, and science management communities alongside sustainability scientists in a process of reflection over how to harness science efforts for sustainable development. That project and its outcomes are separately reported by the present author in this volume.

The purpose in this section, therefore, is to present an example that highlights the growing influence of ISA in terms of wider recognition and uptake of the approach. The illustration concerns recommendations to the UN and its High Level Political Forum on Sustainable Development for monitoring and reporting sustainable development progress and parallel development of the recently released Prototype Global Sustainable Development Report (PGSDR). It was chosen because it illustrates the scale- and application-spanning aspect of ISA, which provides for ISA to be useful in a wide range of sustainability assessment and sustainability governance contexts.

The context is set by the request of Governments at the Rio+20 meeting for the UN to produce a Global Sustainable Development Report (GSDR). Up to that point, there was "no global sustainable development report that comprehensively looks at global progress and future outlook in a truly integrated way"; i.e. that would take account of the range of perspectives in different scientific communities across the world (see: Foreword, United Nations, 2014). A review of sustainable development progress at the global level has since ensued as a collaborative effort involving over 2000 scientists and 50 staff from 20 UN entities from all world regions, resulting in the production of a prototype global sustainable development report.[60] The prototype report illustrates a range of potential content and discusses overall directions for the GSDR. The prototype also maps sustainable development assessments and related processes, reflecting on how best to produce the GSDR given the needs it is intended to serve.

The primary role of the GSDR is to provide input to the deliberations of the High-Level Political Forum on Sustainable Development. There are also other potential roles. According to the Foreword of the Prototype Report, the GSDR could also report on global progress toward the achievement of the sustainable development goals (SDGs), once they have been established in 2015 (see also the Chapter in this volume on design of the SDGs), could provide scientific evidence for linking global goals with the necessary means of achieving them, and could help improve the science-policy interface for sustainable development as called for by UN Member States at Rio+20 (Foreword, United Nations, 2014).

In the context of designing the process through which GSDR will be produced, the collaborating scientific experts were charged with recommending forms of sustainability assessment appropriate for the future monitoring and reporting of global sustainable development status and progress. Through this process, the experts specifically identify and nominate ISA – as developed through the MATISSE project – as a candidate

[60] A first draft of the Executive Summary of the Prototype Global Sustainable Development Report was launched at the inaugural session of the High-level Political Forum on Sustainable Development on 24 September 2013. Following review and further stakeholder consultations, the Executive summary of the Prototype Global Sustainable Development Report was released in June 2014. The full report was launched on 1 July 2014.

assessment approach for producing the Global Sustainable Development Report. Noting that sustainability assessments "differ greatly in terms of scope, scale, organization, process, participation, resources and perceived policy relevance" (United Nations, 2014), and grouping assessments into broad categories based on distinctions among them,[61] the experts drew attention in their report to some core issues informing this decision to recommend consideration of ISA.

The experts note that reviews of sustainable development progress provide evidence that "impressive gains in some areas over recent decades have come at the expense of worsening trends in other areas" (United Nations, 2014, p.103). They conclude from this that integrated assessment is needed to monitor inter-linkages between issues and themes.[62] They note also that views differ across governments, civil society groups, academia, and the public on the progress made, remaining gaps, and ways forward toward sustainable development. They point out that policy recommendations derived from short-run and narrower approaches are often contradictory to those predicated on longer-run, broader considerations. From this they conclude that there is a need for the scale and time frames for assessment to be appropriate in relation to the issues of concern.[63]

They also point out that *scientific* assessments of progress can sometimes lead to rather different results compared to *institutional* assessments, where progress is measured against agreed goals or commitments. While acknowledging that scientific and institutional assessments are both important, the experts draw attention to differences in their nature; specifically, that "a traditional monitoring report focused on progress toward SDGs might not by itself strengthen the science-policy interface, let alone strengthen the science-policy-society interface, which also requires involvement of stakeholders." The experts, therefore, argue the case for a participatory assessment process with stakeholder involvement. Furthermore, they state that bottom-up processes are useful for identifying new and emerging issues. Issues identified through such processes have been found to differ significantly from those highlighted top-down, for example by experts, which suggests that to achieve greater balance in the Global Report it is useful to allow for a wide range of participation through multiple channels.[64]

[61] Three broad groups are distinguished: intergovernmental scientific assessments; scientific-technocratic assessments; and scientific research collaborations.

[62] They comment that "separate assessments and goals exist already for all the thematic areas currently on the agenda of the Open Working Group on SDGs", but that what is currently lacking is an integrated assessment for identifying alternative future pathways that resolve trade-off and build synergies between policy actions. This argues for a pro-active, constructive, goal-seeking, and prescriptive assessment process based upon scenarios and integrated assessment.

[63] "A global scale and the time frame of the next two generations until 2050 – together with intermediate milestones – has proven to be a reasonable choice for addressing – in an inter-generationally equitable way – many of the issues on the sustainable development agenda, such as eliminating poverty and hunger; enabling livelihoods; feeding, nurturing, housing, and educating everyone; securing peace, security and freedom; and preserving the Earth's life support systems" (United Nations, 2014, p.103).

[64] The experts point out that many countries and some regions have established processes to prepare sustainable development reports, many of which are supported by local scientific communities and feature

Following up on these observations and lines of argument, the experts advise considering the implementation of modern ISA as an appropriate assessment process for supporting the development of the GSDR. They complement this recommendation with the definition, description, and explanation of ISA, outlining its character as "a cyclical, participatory process of scoping, envisioning, experimenting and learning" as was defined set out by the MATISSE project. The recommendation quotes the same words and phrases to describe ISA as were first elaborated in the MATISSE project and cites the core references concerning the theoretical, conceptual, and methodological origins and development of ISA.

31.4 Conclusion

Increasingly, ISA is being recognised as useful in supporting bottom-up approaches to addressing problems of unsustainable development, for example by providing frameworks for action research on the part of sustainability scientists, frameworks for community and citizen-led initiatives in citizen science, and frameworks for sustainability governance of adaptation and similar initiatives. The features embedded in the framework and processes of ISA are increasingly becoming recognised as those likely to be needed for orienting and coordinating myriads of bottom-up initiatives so that these are supportive and respectful generally of top-down sustainability goals and sustainability constraints while releasing and harnessing local innovative potentials in developing context-sensitive solutions to issues that engage local stakeholders. As the PGSDR recommendation reflects, the prospects for sustainable development at a global scale depend crucially on a myriad of bottom-up initiatives that are oriented toward and steered by top-down sustainability concerns as well as by local sustainability conditions and criteria. It is also important for there to be "early-warning" systems in place to alert international organisations and bodies, such as those of the United Nations, to emerging threats and problems, and that an information system is established that provides for multi-directional flows of intelligence. It is in its capacity to bridge between top-down and bottom-up interventions and to work towards harmony between them that ISA holds potential to make a unique contribution.

local priorities. Hence, the expert group recommends a bottom-up approach to enable the global Report to benefit from "such rich and dispersed local policy-relevant knowledge", albeit with the caveat that protocols might be needed for evaluating non-conventional sources of scientific knowledge.

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Chapter 32

Globalisation and health: an indicator-based statistical analysis[65]

Su-Mia Akin, Pim Martens and Maud Huynen

[65] Based on: Martens, P., Akin, S., Huynen, M., and Raza, M. (2010). Is globalization healthy: A statistical indicator analysis of the impacts of globalization on health. Globalization and Health, 6 (16).

Abstract

Globalisation has positive and negative consequences for our health. This study aims to analyse the relationship between globalisation and health using an indicator-based statistical analysis to link the Maastricht Globalisation Index (MGI), a measure of globalisation, to health indicators. The key challenge in studying globalisation and its health consequences is complexity. We make this complexity explicit by employing an integrative, pluralistic perspective. The resulting crude indication of the potential advantageous effect of globalisation on health should be interpreted with caution in view of the argument that globalisation creates winners and losers, and should not be taken as a simple confirmation that globalisation is good for our health. A fuller understanding of the causal relationship between globalisation and health can help to optimise health outcomes of global processes, and thereby contribute to healthy and sustainable development. This requires more research embracing the complexity of the globalisation–health relationship.

32.1 Introduction

Processes of globalisation are influencing our health, and whether these health consequences of globalization are largely positive or negative still remains unclear. The relationship between globalisation and health is characterised by multiple links and feedbacks. In order to capture this complexity, we use a pluralistic integrated view of this relationship. To analyse the relationship between globalisation and health, we use an indicator-based statistical analysis to link the Maastricht Globalisation Index (MGI), a measure of globalisation, to health indicators. This is followed by a discussion of the results and by an indicator-based statistical analysis. As a way forward, we propose a potential classification of countries based on their level of globalisation and their health performance. The chapter concludes with some lessons to be learned.

32.2 Relation to sustainable development

The topic of globalisation and health can be classified under the social dimension of sustainability. However, the integrated view of the globalisation–health relationship, encompassing a variety of processes, extends this research into the other (environmental, economic, and institutional) domains of sustainable development as well. A deeper understanding of the relationship between globalisation and health can help to enhance positive and mitigate negative health outcomes of globalisation. Such an understanding can support progress towards more healthy and overall sustainable ways of development in the face of global change. Improving health and well-being is and will remain one of the driving forces for achieving sustainable development at a global level as we move towards the 2015 deadline of the Millennium Development Goals (MDGs) (Griggs et al., 2013).

32.3 An integrated approach to globalisation and health, and the challenge of complexity

Globalisation is a widely used concept to describe contemporary global change processes across different sectors (Scholte, 2002). Besides economic developments taking place at a global scale, globalisation also incorporates political, technological, socio-cultural, and environmental global change processes, so it can be seen as an overarching process encompassing different simultaneously unfolding developments in various domains and at different scales. Globalisation is a phenomenon shaped by a wide range of factors, leaving its imprints on our society. The complexity of this multi-dimensional global phenomenon is suitably captured by the definition offered by Rennen and Martens (2003): "[…] an intensification of cross-national cultural, economic, political, social and technological interactions that lead to the establishment of transnational structures and the global integration of cultural, economic, environmental, political and social processes on global, supranational, national, regional and local levels (p.143)".

The determinants and outcomes of health are influenced by globalisation (Lee, 2004). A conceptual framework developed by Huynen (M. Huynen, 2008; M. M. T. E. Huynen, Martens, & Hilderink, 2005) describes the relationship between globalisation and health, illustrating how the globalisation process interacts with determinants of health. The key challenge in studying globalisation and its health consequences is complexity. For the purpose of this chapter, complex problems can be seen as problems encompassing many interlinked problems at the same time, covering different disciplines, exiting at different scales, and involving many different stakeholders (Valkering, Amelung, Van der Brugge, & Rotmans, 2006). The relationship between globalisation and health involves different dimensions, processes, scales, and linkages and pathways. In order to make this complexity explicit, we view globalisation and health from an integrative, pluralistic perspective.

32.4 Method and approach to the statistical analysis

Empirical (quantitative) evidence on the links between globalisation and health is currently lacking. Many scholars have called for further research and possibly more quantitative evidence on these links (Beaglehole & Bonita, 2000; Dollar, 2001; Drager & Beaglehole, 2001; M. M. T. E. Huynen et al., 2005; Lee, 2001; Lee & Collin, 2001; Martens, McMichael, & Patz, 2000; Smith, Woodward, Acharya, Beaglehole, & Drager, 2004; WHO, 2001; Woodward, Drager, Beaglehole, & Lipson, 2001). To analyse whether more globalised countries are doing better or worse in terms of their population health status, we assess the relation between globalisation i and health indicators. For this purpose we use an indicator-based approach (Dreher, Gaston, & Martens, 2008) linking the Maastricht Globalisation Index (MGI) (a measure of globalisation) to important health indicators, correcting for possible confounding factors. The MGI is a weighted composite index incorporating indicators that cover the following domains: political, economic, social and cultural, technological, and ecological. The pluralistic conceptualisation of globalisation presented above is also reflected in the wide range of domains incorporated in the MGI. Higher values of the MGI denote more globalisation. The MGI dataset includes 117 countries (Martens & Raza, 2009; Martens & Zywietz, 2006; www.globalisationindex.info). The present analysis used the MGI for 2008. See Figure 32.1 for a map of the MGI for 2008.

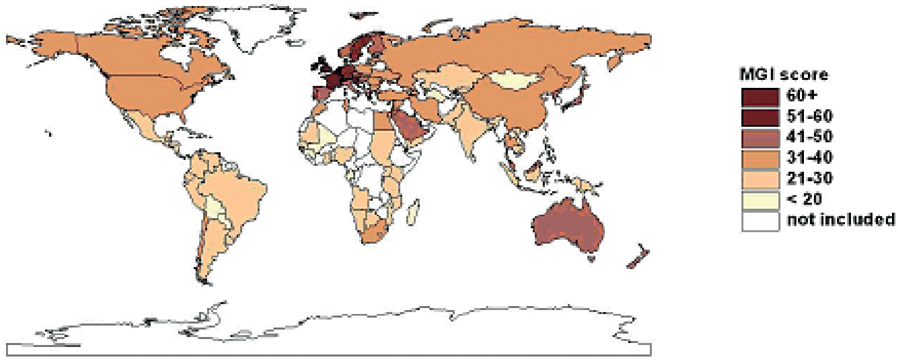

Figure 32.1 Map of the Maastricht Globalisation Index (MGI) 2008 (www.globalisationindex.info)

In order to link a country's level of globalisation with the status of population health in that country, several mortality indicators have been selected, based on the World Health Statistics (WHO, 2009b):

- infant mortality rate (per 1000 live births, both sexes): "[…] the probability of a child born in a specific year or period dying before reaching the age of one, if subject to age-specific mortality rates of that period (WHO, 2009a)";
- under-five mortality rate (probability of dying by age 5 per 1000 live births, both sexes): "the probability of a child born in a specific year or period dying before reaching the age of five, if subject to age-specific mortality rates of that period (WHO, 2009a)"; and
- adult mortality rate (probability of dying between the ages of 15 to 60 years per 1000 population, both sexes): "probability that a 15-year-old person will die before reaching his/her 60th birthday (WHO, 2009a)".

According to the World Health Organisation (WHO, 2009a), such indicators provide an accurate view of overall population health (see also e.g. WHO, 2008). The selected mortality indicators are available for all 117 countries in the MGI dataset. The statistical analysis used the following methods: correlation analysis, least squares (LS) simple linear regression analysis, and multiple regression analysis.

32.5 Statistical indicator analysis: results and discussion

The results of the analysis (Spearman's correlations, simple and multiple linear regression analyses) indicate that the infant mortality rate, under-five mortality rate, and adult mortality rate all show a negative association with the process of globalisation (as measured by the MGI). Specifically, technological globalisation and socio-cultural globalisation are shown to have strong associations with the selected health indicators.

In all multivariate models, the association between globalisation and the mortality indicators remains significant after controlling for confounding factors[66].

These results might provide a crude initial indication of the potential advantageous effect of globalisation on health. In other words, high levels of globalisation appear to be associated with low mortality rates. However, in view of the argument that globalisation creates winners and losers, interpretation of the resulting positive association between the MGI and health should be done with caution and not taken as a simple confirmation of globalisation being good for our health.

The use of the MGI, and globalisation indices in general, comes with several limitations. Data on international linkages cannot be distinguished with complete certainty from globalisation and regionalisation data. Thus there is an underlying assumption that countries with many international linkages have a correspondingly greater number of global linkages.[67] Data from some countries is either difficult to get or has not been collected, which limits the number of countries that could be included in the MGI. Moreover, the MGI is based on a weighting method, which is in essence normative. For transparency reasons, we have applied equal weighting (OECD, 2008). The indicator data have been collected at the country level, and thus do not fully capture the interactions of globalisation with health at levels that exceed national levels. (For a more elaborate discussion of the limitations of the MGI and similar indices, see the original publication.)

[66] The multivariate analyses found different confounders to be significant in the three final models. Specifically, confounders accounting for primary and secondary education and public health expenditures were found to be significant for Ln Infant mortality rate. For the Ln Under-five mortality rate, not only the confounders for primary and secondary education but also smoking prevalence among women proved to be significant in the final model. Lastly, only a confounder regarding access to improved sanitation facilities proved significant for the model of Ln Adult mortality rate. These factors can thus possibly function as confounders in the relationships between the respective mortality rates and the MGI. However, the confounders in the final models could also be important mediating/causal factors in the association between the mortality rates and the MGI. Either way, in all multivariate models, the association between globalisation and the mortality indicators remains significant after controlling for confounding factors.

[67] For the purpose of clarification: From a conceptual point of view, international linkages or internationalisation “refers to a growth of transactions and interdependence between countries (p.8) (Scholte, 2002)”. Global linkages or globalisation, however, go beyond between-country interactions and refer to “transplanetary connectivity” and “supraterritoriality”, thus challenging territorialist geography. “Globality in the broader sense of transplanetary relations refers to social links between people located at points anywhere on earth, within a whole-world context” (p.15) (Scholte, 2002). This view is distinct from international linkage, as this refers to exchanges between countries, and global linkage, which refers to exchanges within the world, where the world is not made up of geographical country units, but is a social space in itself (Scholte, 2002). This conceptual difference is important with regard to the use of indicators to measure globalisation. Available (and reliable) data usually pertain to indicators for cross-border activities between counties; thus data usually relies on the geography of countries (Scholte, 2002). Due to the use of such data and indicators, therefore, an implicit assumption is made that as countries have more international linkages, they will also be more globalised.

32.6 Reflection and a way forward

The results of the statistical indicator analysis and their interpretation show that the relationship between globalisation and health is more complex. Without being able to state with certainty whether globalisation will overall be beneficial or detrimental to our health, it is important to step away from this and focus on the direction that global dynamics should take in order to achieve sustainable health aims. For future research we hypothesise that countries can be classified into four categories according to their level of globalisation and health status (adapted from Ranis, 2006):

- Vicious cycle (low globalisation, high mortality)
  In the vicious cycle, any efforts to properly integrate into the global process are as yet unsuccessful, and might even result in (temporary) adverse health effects (e.g. Ghana).
- Globalisation-lopsided (high globalisation, high mortality)
  Globalisation-lopsided may happen when integration into the globalisation process has not yet resulted in major health benefits, or may even have resulted in increasing health problems (e.g. Egypt).
- Health-lopsided (low globalisation, low mortality)
  Health-lopsided may happen when health improvements occur that are not related to any globalisation benefits, but due to other domestic policies or developments (e.g. Peru).
- Virtuous cycle (high globalisation, low mortality)
  In a virtuous cycle, countries may benefit from their integration into the globalisation process, while averting any associated health risks. It is important to note, however, that for some countries the virtuous cycle could be the result of bias due to causal sequence (i.e. did all the major improvements in health already occur prior to the modern-day globalisation process?) (e.g. the Netherlands).

32.7 Lessons

The results of the statistical analysis of the consequences of globalisation for health show that globalisation and its linkages to health are complex. The statistical analysis is a useful method to gain a crude insight into the relationship at hand. The identification of possible confounders is also a step towards understanding which factors are potentially relevant to the globalisation–health relationship. However, when drawing conclusions from such (global) statistical analyses it is important to be cautious and keep the above limitations and underlying assumptions in mind. A reflection on the merits and limitations of the indicator-based statistical analysis makes it clear that such an approach cannot by itself capture the full picture. The hypothesised country categories may provide a helpful framework for future research into the globalisation–health relationship as well as related potential policy implications.

The challenge of complexity has become very apparent when examining global change issues. For the topic of globalisation and health this means that an integrative approach in terms of conceptual meaning is helpful to make this complexity explicit. At the same time this also requires research which incorporates different perspectives, and multiple disciplines and methods (complementary to a statistical indicator analysis).

A deeper understanding of the causal relationship between globalisation and health can help to manage global processes in such a way that its benefits to health are enhanced and its negative impacts on health can be minimised, and thereby contribute to healthy and sustainable development. More empirical research is necessary to uncover the causal mechanisms underlying globalisation and health. The understanding that is critical for (future) sustainable development and health requires us to embrace greater complexity (M. Huynen, Martens, & Akin, 2013; Soskolne, Butler, Ijsselmuiden, London, & von Schirnding, 2007).

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Chapter 33

Globalisation continues: The Maastricht Globalisation Index revisited and updated[68]

Lukas Figge and Pim Martens

[68] This chapter is a shortened and adapted version of Figge, L., & Martens, P. (2014). Globalisation continues: The Maastricht Globalisation Index revisited and updated. Globalizations, 11(6), 875-893.

Abstract

Globalisation is a complex process which leads to increasing connectedness and interrelatedness in the political, economic, social and cultural, technological, and environmental domains at many different scales. While this is a truly global phenomenon, it also has different impacts and manifestations in different geographic localities. As a result, different nations exhibit different levels of globalisation or connectedness. Furthermore, perspectives on globalisation are manifold and change over time, so it is crucial to continuously reflect upon and revise existing methodologies. Composite indices are a powerful tool to capture and measure complex concepts, allowing complex systems to be monitored over time and yielding relative rankings and comparisons. This chapter presents a revised and updated Maastricht Globalisation Index for 117 countries and three points in time – 2000, 2008, and 2012 – including a new calculation methodology and data. Results show that globalisation still continues but has slowed down recently.

33.1 Introduction: a pluralistic approach to globalisation

Globalisation has the key characteristics of being multi-dimensional and multi-scalar. As laid out by Jessop (2000), globalisation is the result of the co-evolution of nested and complex system structures, rather than exhibiting simple and one-dimensional characteristics. This pluralistic (or complexity-based) approach enables us to perceive globalisation as a phenomenon, or an over-arching process in which many different processes take place simultaneously in many domains (Martens & Rotmans, 2005; Martens & Rotmans, 2002). After all, not all factors that underlie or shape globalisation, or all the consequences of this process, have as yet been identified. Acknowledging the pluralistic character of the driving forces and its consequences is an essential step in describing the phenomenon. From a conceptual perspective, this implies that one cannot grasp the full extent of globalisation by looking at it only from one perspective. However, one can more or less consciously choose to ignore other dimensions. Taking a truly global or holistic perspective on globalisation by acknowledging its multi-scalarity also has certain implications. Processes and structures at different scales, i.e. the global, international, regional, national and sub-national scales, are seen to be interconnected and co-evolving and should therefore not be analysed in isolation. Several scholars who follow Scholte's definition of globalisation as supra-territoriality regard it as a single process that takes place only at the global scale. Accordingly, they argue that it should be conceptually differentiated from other concepts, such as internationalisation, liberalisation and universalisation (Caselli, 2012; Dreher, Gaston, Martens, & Van Boxem, 2010; Lombaerde & Lapadre, 2008; Scholte, 2005, 2008).

In the broadest sense, globalisation is defined as "the growing interconnectedness and inter-relatedness of all aspects of society" (Jones, 2010). Adding multi-dimensionality and multi-scalarity, we define contemporary globalisation as the intensification of cross-national interactions that promote the establishment of trans-national structures and the global integration of cultural, economic, ecological, political, technological, and social processes at global, supra-national, national, regional, and local levels (Rennen & Martens, 2003). Taking a global systems perspective, globalisation as the growing interconnectedness of sub-systems results in increasing system complexity at various scales, although different national systems may of course exhibit diverging levels of connectedness and complexity.

From a scientific perspective, it is crucial to develop tools and methods to measure and assess complex phenomena, such as globalisation. Section 1 below introduces composite indicators, and more specifically the Maastricht Globalisation Index. Section 2 describes the empirical operationalisation of the different components. Section 3 explains the recently updated calculation methodology. Section 4 reports the results, showing the state of globalisation and changes therein for 117 countries for the years 2000, 2008 and 2012. Section 5 discusses some issues regarding the quantitative empirical work on globalisation.

33.2 The Maastricht Globalisation Index (MGI)

One powerful tool to grasp, illustrate, monitor, and communicate complex issues or concepts that exhibit multi-dimensionality, such as globalisation, is that of composite indicators (CIs). CIs are constructed by aggregating individual quantitative or qualitative indicators into a final index. Most CIs are constructed at a national level, thereby allowing for a relative ranking or comparison of country performance (OECD, 2008). It is important to acknowledge that CIs are quantitative, mathematical, or computational models and their construction process involves many subjective choices by the person who puts them together. In his critique, Caselli (2012) argues that globalisation can only be measured indirectly. Accordingly, there is not one correct or objective way to do it, and it is rather important that subjective methodological choices are made transparent.

One composite indicator is the Maastricht Globalisation Index (MGI), developed by Martens & Raza (2009); Martens & Zywietz (2006); and Rennen & Martens (2003), and further applied in Martens, Akin, Maud, & Mohsin (2010); Martens & Amelung (2010); and Martens & Raza (2010). For a detailed discussion of the use of indicators to measure globalisation, we refer to Dreher et al. (2008). For critical reflections see Caselli (2008) and (2012); Dreher et al. (2010); and Lombaerde & Lapadre (2008). For the most recent overview on "new directions in Globalisation Indices" we refer to Martens et al. (2015). The following sections describe the successive steps of the index construction process, namely the choices of domains and variables and the calculation methodology.

33.3 Components of the MGI

The choice of which domains and indicators to include and which to omit is a subjective one. Different scholars would make, and already have made, different choices for their own reasons, as the variety of existing indices shows. Where one researcher may decide to include a particular domain/indicator or not, another might make the opposite choice, with arguments which may be equally valid; the same holds for the calculation method, as is explained below. The choices reflect a person´s perception of what he or she thinks are the most important aspects. The choice is also subject to data availability and quality. Indicators included in a CI should therefore be seen as exemplifying the major themes within the globalisation debate, as perceived by its author. However, stating that one is making an objective measurement or that a CI represents an objective truth about globalisation creates the danger of hiding behind a "veil of quantitative and statistical objectivity."

The original MGI (Martens & Zywietz, 2006) was an effort to improve on the indices characterised by a neo-liberal focus on the economic dimension of globalisation. The first step in its development was to choose the domains. In line with the multi-dimensional definition of globalisation set out above, the MGI is made up of 5 domains:

the political, economic, socio-cultural, technological, and environmental domains. Table 33.1 lists all the sub-indicators which were chosen. Log means that the data has been transformed by taking the logarithms, for reasons explained in the section on the calculation of the MGI. What makes the MGI unique compared to other multi-dimensional globalisation indices is the inclusion of the environmental domain and an indicator of the globalisation of a country's military-industrial complex. The current version of the MGI covers 117 countries (see Figure 33.1 and Table 33.2 in section 33.5).

Table 33.1 Maastricht Globalisation Index (MGI) indicators.

Domain	Indicator name, abbreviation	Weight / transformation	Indicator definition
Political	Embassies (Emb)	1/15	Absolute number of in-country embassies and high commissions
	Organisations (Org)	1/15	Absolute number of memberships in international organisations
	Military (Mil)	1/15 Log	Trade in conventional arms as a share of military spending
Economic	Trade (Tra)	1/15	Imports + exports of goods and services as a share of GDP
	FDI (Fdi)	1/ 15 Log	Gross foreign direct investment, stocks (% of GDP)
	Capital (Cap)	1/15 Log	Absolute value of net private capital flows (% of GDP)
Social & Cultural	Migrants (Mig)	1/10 Log	International migrant stock as a share of population
	Tourism (Tou)	1/10 Log	International arrivals + departures per 100 inhabitants
Technological	Cell Phone (Cel)	1/ 10	Mobile cellular subscriptions per 100 inhabitants
	Internet (Int)	1/10	Internet users as a share of population
Environmental	Eco footprint (Env)	1/5 Log	Ecological footprint of imports and exports as a share of biocapacity

33.4 Calculation of the MGI

Calculating the index is the next step in the construction process. For an overview of the different methodological approaches we refer to the OECD "Handbook on Constructing Composite Indicators" (OECD, 2008). The calculation methodology is just as subjective as the choice of domains and indicators to be included. This section briefly explains the calculation methodology applied in the MGI.

The first step involves calculation of indicators and imputation of missing data. Calculation is necessary for those indicators that are not directly available as used in the index. Imputation of missing data is done through extrapolation from historical data. Secondly, indicators which have highly skewed distributions are transformed by taking the logarithm. This is a necessary step for the normalisation of the data and is applied to the variables military, FDI, capital, migrants, tourism, and eco-footprint (see Table 33.1). Thirdly, following Dreher (2006), indicator scores are calculated, by applying panel normalisation and using the formula $((V_i\text{-}V_{min})/(V_{max}\text{-}V_{min})*100)$. As a result of the previous steps, we can then finally aggregate the indicators first at the domain level and subsequently at the MGI level. Here equal weighting is applied in both aggregation steps, in agreement with our multi-dimensional definition of globalisation. We assume that there is no hierarchy of domains, but that each is equally important. The final score is then used to rank and compare countries. The higher the score, the more "globalised" a country is (see Table 33.2).

The data used in the MGI does not distinguish explicitly between globalisation, internationalisation, and regionalisation. Whereas some see this as a problem (Caselli, 2012; Lombaerde & Lapadre, 2008), we rather argue that this is in line with our multi-scalar definition. Accordingly, internationalisation and regionalisation are seen as integral sub-processes of globalisation, rather than as separate processes. Accordingly, we do not claim to measure globalisation as defined by Scholte as supraterritoriality (2008). We make the implicit assumption that countries with many international and regional links also have a greater number of global linkages. Furthermore, we do not distinguish between the globalisation based on the two criteria of functional (economic) integration and the extent of geographical spread as laid out by Dicken (2011). An index of globalisation as a distinctive process is definitely interesting, but cannot be constructed with the data at hand. Concluding, one could argue that the MGI should actually be called Maastricht Globalisation / Internationalisation / Regionalisation Index.

33.5 Results

Composite indicators allow for several types of observations. First, "global" observations can be made about general trends (e.g. increasing or decreasing). Secondly, the scores and rankings reveal relative changes in individual countries. Thirdly, observations can be made for groups of countries that are clustered according to certain characteristics (e.g. geographic region, economic performance, and level of globalisation). And lastly, indicators that have been constructed with different methodologies can be compared. This analysis is limited to the first two types of observations.

On average, the globalisation scores of countries rose from 40.56 in 2000 to 51.19 in 2012. The most significant driver has been the technological domain, which increased from 1.89 to 9.08. This should not be surprising, given that the indicators for this domain are internet users and mobile phone subscriptions. Globalisation was slower between 2008 and 2012 than in the preceding period, with an absolute decrease in the economic domain. This is due to the global economic crisis which started in 2008 and had still not been fully overcome in 2012.

Table 33.2 gives an extensive overview of ranks, scores, and developments over time. The first column is the rank according to the MGI for 2012 and "dR 00-12" is the change (d = delta) in rank between 2000 and 2012. The results for the 2012 MGI score can also be seen in Figure 33.1.

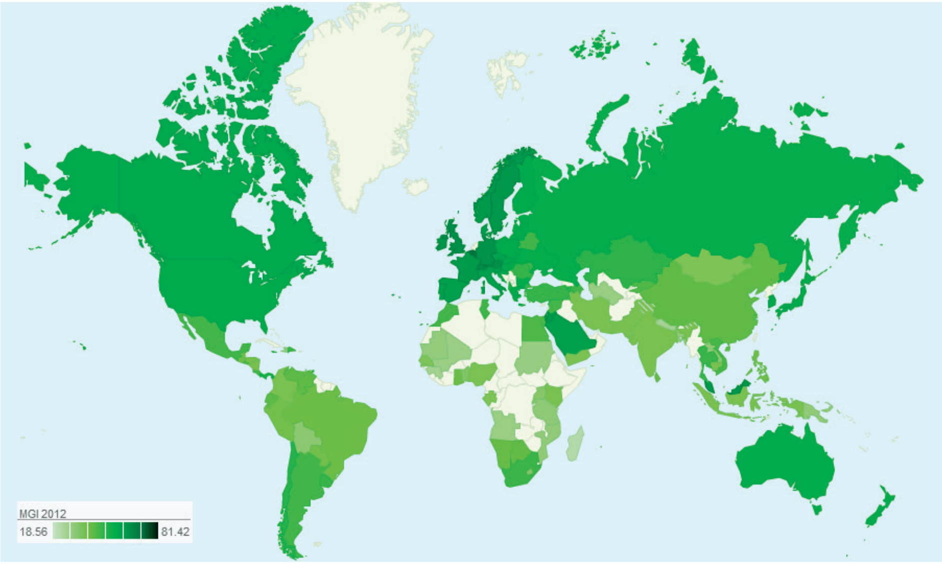

Figure 33.1 World Map of MGI 2012

The most globalised country is Belgium, followed by the Netherlands, Switzerland, the UK, Austria, and Germany. In general, the top end of the list is dominated by European countries. Interestingly, however, Malaysia managed to jumped up by 10 ranks and is now the 9th most globalised country, while Jordan ranks 12th. The BRICS countries, which are said to be the biggest emerging economies of the 21st century rank 39 (Russia), 53 (South Africa), 71 (China), 75 (Brazil) and 85 (India). An interesting finding is that South Africa actually dropped by 6 ranks, while all of the others rose by between 11 and 18 ranks. The lowest ranking countries are Burundi, Madagascar, Nepal, Guinea, Mali, Angola, and Turkmenistan.

The next three columns give the scores for 2000, 2008, and 2012, while "dS 00-12" is the change in score between 2000 and 2012. The colour of the columns visualises the above observation that the general trend is towards more globalisation. Only two countries, Papua New Guinea and Burundi, were (slightly) ‘de-globalising’ in absolute terms. Most notably, Albania increased its rank by 42 and its score by 25.24 points.

The last column, “more G recently”, is the per annum change between 2000 and 2008 minus the per annum change between 2008 and 2012. Accordingly, a positive number means that countries have been globalising more in the period between 2008 and 2012 than in the period between 2000 and 2008. Highest scoring countries here are Armenia, Botswana, Turkmenistan, Nepal, and Mongolia. A general observation is that this is rather the case for some lower-ranking countries, whereas globalisation processes have been slowing down in the more highly ranking countries. There are two plausible explanations. First, those countries had a strong momentum for globalisation, and secondly they were initially less integrated in the global capitalist system, so the economic crisis had a smaller impact on them.

Table 33.2 Maastricht Globalisation Index (2012)

country	Rank 12	dR 00-12	Score 00	Score 08	Score12	dS 00-12	more G recently
Belgium	1	1	67.86	77.25	81.42	13.56	-0.13
Netherlands	2	-1	69.22	78.72	78.12	8.90	-1.34
Switzerland	3	0	65.72	73.78	74.69	8.96	-0.78
United Kingdom	4	5	58.79	71.18	73.21	14.42	-1.04
Austria	5	-1	61.55	72.11	72.81	11.27	-1.15
Germany	6	-1	61.26	68.97	72.22	10.96	-0.15
Ireland	7	4	58.11	68.17	70.94	12.82	-0.56
Sweden	8	-2	60.82	69.49	70.74	9.92	-0.77
Malaysia	9	10	54.89	65.79	70.69	15.80	-0.14
France	10	-3	59.65	68.60	69.91	10.27	-0.79
Norway	11	4	56.72	67.77	69.71	13.00	-0.90
Jordan	12	4	55.71	66.70	69.57	13.85	-0.66
Denmark	13	-5	59.58	70.20	68.73	9.15	-1.70
Israel	14	-4	58.40	66.24	68.29	9.89	-0.47
Spain	15	2	55.17	66.41	68.23	13.06	-0.95
Italy	16	-4	57.25	65.25	68.04	10.80	-0.30
Saudi Arabia	17	13	49.66	63.37	67.95	18.30	-0.57
Portugal	18	5	52.45	64.06	67.43	14.98	-0.61
Czech Republic	19	7	51.91	65.45	66.76	14.84	-1.37
Slovenia	20	9	50.19	61.89	66.74	16.56	-0.25
Kuwait	21	-1	54.51	64.85	64.80	10.29	-1.31
Hungary	22	5	51.65	64.62	64.43	12.78	-1.67
Korea, Rep.	23	-1	52.89	63.93	64.33	11.43	-1.28
Canada	24	-11	56.90	61.34	64.13	7.22	0.14
Croatia	25	13	44.04	61.00	63.84	19.79	-1.41

country	Rank 12	dR 00-12	Score 00	Score 08	Score12	dS 00-12	more G recently
Slovak Republic	26	10	45.49	62.06	62.87	17.39	-1.87
Finland	27	-13	56.88	61.09	62.72	5.84	-0.12
Poland	28	9	45.05	59.56	62.66	17.62	-1.04
Japan	29	2	49.47	59.25	62.43	12.96	-0.43
Estonia	30	-9	53.21	61.08	62.31	9.10	-0.67
United States	31	-13	55.00	61.41	62.18	7.18	-0.61
Lithuania	32	7	43.99	59.89	61.74	17.75	-1.53
New Zealand	33	-8	52.25	60.33	61.59	9.34	-0.69
Greece	34	-10	52.26	61.56	61.59	9.32	-1.15
Latvia	35	5	43.95	59.73	60.81	16.87	-1.70
Bulgaria	36	7	43.16	61.52	60.66	17.50	-2.51
Australia	37	-9	50.78	58.67	60.59	9.81	-0.51
Ukraine	38	3	43.70	56.92	60.09	16.39	-0.86
Russian Federation	39	15	40.88	54.39	59.92	19.04	-0.31
Trinidad and Tobago	40	-5	45.77	55.05	57.56	11.80	-0.53
Panama	41	4	42.56	51.85	57.47	14.92	0.24
Albania	42	42	31.98	51.61	57.22	25.24	-1.05
Armenia	43	17	39.08	43.98	55.71	16.63	2.32
Chile	44	2	42.45	52.45	55.58	13.13	-0.47
Jamaica	45	-12	46.82	56.81	55.49	8.67	-1.58
Kazakhstan	46	-14	47.57	50.94	55.00	7.43	0.60
Macedonia	47	6	40.92	52.62	54.56	13.64	-0.98
Mauritius	48	-14	46.51	53.36	54.34	7.82	-0.61
Romania	49	12	38.87	53.63	53.78	14.91	-1.81
Turkey	50	9	39.10	51.45	53.64	14.54	-1.00
Uruguay	51	13	38.62	51.19	53.55	14.93	-0.98
Thailand	52	-10	43.64	52.35	53.27	9.63	-0.86
South Africa	53	-6	42.41	51.25	52.97	10.57	-0.67
Dominican Republic	54	2	40.26	47.35	52.71	12.45	0.45
Georgia	55	0	40.58	48.89	52.21	11.63	-0.21
Azerbaijan	56	10	38.00	48.29	52.07	14.06	-0.34
Moldova	57	1	39.51	49.76	52.03	12.52	-0.72
Tunisia	58	-14	42.73	53.33	51.91	9.18	-1.68
Argentina	59	-11	42.35	49.12	51.69	9.34	-0.20
Belarus	60	-11	41.58	47.62	51.68	10.10	0.26
Morocco	61	8	36.95	47.86	51.40	14.45	-0.48
Mexico	62	-12	41.21	46.98	51.38	10.17	0.38
Syria	63	5	37.18	46.05	51.29	14.11	0.20
Costa Rica	64	-12	40.99	49.67	51.20	10.21	-0.70

country	Rank 12	dR 00-12	Score 00	Score 08	Score12	dS 00-12	more G recently
Viet Nam	65	22	31.67	44.59	50.46	18.79	-0.15
Egypt, Arab Rep.	66	-9	39.71	47.74	50.04	10.33	-0.43
Kyrgyzstan	67	12	32.73	46.13	49.36	16.63	-0.87
El Salvador	68	3	36.51	45.94	48.93	12.42	-0.43
Ecuador	69	4	34.44	40.36	47.20	12.76	0.97
Venezuela, RB	70	-8	38.83	45.81	46.74	7.91	-0.64
China	71	11	32.54	41.59	46.44	13.90	0.08
Botswana	72	-5	37.96	38.94	45.95	7.99	1.63
Namibia	73	-22	41.05	46.92	45.37	4.32	-1.12
Sri Lanka	74	-4	36.93	42.15	44.39	7.46	-0.09
Brazil	75	16	30.84	39.35	44.01	13.17	0.10
Ghana	76	-13	38.78	42.15	43.61	4.83	-0.05
Guatemala	77	6	32.30	41.22	43.41	11.11	-0.57
Philippines	78	-13	38.29	41.68	43.21	4.92	-0.04
Paraguay	79	13	30.78	40.49	42.67	11.89	-0.67
Gambia, The	80	-4	34.22	40.42	42.23	8.01	-0.32
Peru	81	13	29.89	41.44	42.20	12.31	-1.25
Honduras	82	7	31.31	40.69	41.91	10.61	-0.87
Nicaragua	83	5	31.50	37.26	41.44	9.93	0.32
Cambodia	84	11	29.61	39.57	40.96	11.36	-0.90
India	85	18	28.00	35.13	40.66	12.66	0.49
Indonesia	86	-5	32.60	36.54	40.58	7.98	0.52
Pakistan	87	-2	31.91	39.09	40.34	8.44	-0.58
Kenya	88	-8	32.62	36.92	40.31	7.69	0.31
Iran	89	-11	32.82	36.78	40.21	7.39	0.36
Colombia	90	8	28.78	38.48	40.19	11.41	-0.78
Nigeria	91	5	29.56	38.00	39.87	10.31	-0.59
Yemen	92	-20	35.54	39.89	39.72	4.18	-0.59
Mongolia	93	20	22.89	30.71	38.95	16.05	1.08
Gabon	94	-17	34.03	38.20	38.89	4.86	-0.35
Senegal	95	5	28.37	36.98	38.75	10.38	-0.63
Cote d'Ivoire	96	-10	31.89	37.32	38.17	6.28	-0.47
Benin	97	8	27.72	35.50	37.65	9.92	-0.43
Uganda	98	3	28.32	33.90	36.12	7.80	-0.14
Togo	99	-9	31.02	35.21	35.90	4.88	-0.35
Lesotho	100	-26	34.43	35.39	35.22	0.80	-0.16
Bolivia	101	6	26.58	33.37	34.87	8.30	-0.47
Rwanda	102	0	28.31	31.47	34.59	6.28	0.38
Laos	103	3	26.98	31.24	34.38	7.40	0.25

country	Rank 12	dR 00-12	Score 00	Score 08	Score12	dS 00-12	more G recently
Tanzania	104	0	27.72	33.97	33.89	6.17	-0.80
Mozambique	105	3	25.96	32.08	33.46	7.50	-0.42
Papua New Guinea	106	-31	34.35	33.25	33.45	-0.90	0.19
Haiti	107	2	25.39	31.79	33.20	7.81	-0.45
Bangladesh	108	-9	28.51	33.24	33.08	4.58	-0.63
Mauritania	109	1	24.96	29.31	32.67	7.71	0.29
Sudan	110	2	24.05	31.88	31.77	7.72	-1.01
Turkmenistan	111	-18	30.10	27.10	31.56	1.46	1.49
Angola	112	-15	29.14	30.77	31.18	2.04	-0.10
Mali	113	-2	24.45	27.94	30.84	6.39	0.29
Guinea	114	0	22.40	27.84	28.42	6.02	-0.54
Nepal	115	0	21.18	21.82	27.91	6.72	1.44
Madagascar	116	1	17.27	23.84	23.65	6.38	-0.87
Burundi	117	-1	19.13	17.15	18.56	-0.57	0.60

33.6 Is globalisation good or bad?

Globalisation indices by themselves do not contribute much to the debate on whether it is good or bad. Linking the MGI to indices of sustainability may give better answers to the question whether globalisation is good or bad. Several studies with the MGI have shown that countries that are more globalised are also more sustainable, and in general also healthier (Martens, et al., 2010; Martens & Raza, 2010). A review of the work with the KOF index of globalisation further shows that contemporary globalisation has exerted positive effects on economic growth and human rights, but negative effects on within-country inequality (Potrafke, 2014). At the same time, international trade allows for externalisation of social and environmental costs. The pressures and impacts of consumption on distant socio-economic and ecological systems are detached from the experience of consumption. Two recent studies (Weinzettel et al., 2013; Yu et al., 2013) show that countries with higher incomes, such as the US, Europe, and Japan, for example, displace 33%, 50%, and 90%, respectively, of their land use to other countries, through international trade. Taking a multi-dimensional perspective, it would be interesting to analyse whether countries that are more globalised (not only in the economic domain) have larger ecological footprints. Globalising countries may achieve desirable outcomes in human development, health, and economic performance, but may do so within a global system that puts other countries and the natural world at a disadvantage by externalising social and environmental costs.

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Chapter 34

Pro-active reflexivity: advancing the science-for-sustainability agenda[69]

Paul Weaver

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Abstract

Supporting more sustainable development makes special demands on scientists, often requiring researchers to work in ways that differ qualitatively from the usual ways in which science works. In turn these requirements call for changes in science funding and management practices. Changes in science management and funding to better support scientists are needed both to "harness" science for sustainable development and to leverage the societal effectiveness of investments in science. This chapter describes the methodological approach of the recently-completed VISION RD4SD action (VISION for Research and Development for Sustainable Development) that was charged with raising awareness of the issue and developing appropriate responses. The chapter describes core outcomes of the action, including a set of guiding principles for science programme funders, developers, and managers, and a proposal for establishing a European platform for sustainability science.

34.1 Introduction

Reflecting on a recently completed research-and-support action funded by the European Commission, O'Riordan et al. (2015) highlight the great responsibility that lies with science policy makers and science funders in aligning their programmes to the growing challenges of unsustainability and in setting frameworks for research programme design, funding, and evaluation that take these challenges into account. The action was carried forward over the period 2010-13 under the acronym: VISION RD4SD (VISION for Research and Development for Sustainable Development).[70] It was motivated by concern to increase the effectiveness of investments in science and to harness science in pursuit of more sustainable development. ICIS was one of the main providers of research support to the action, whose partners included representatives of both the science policy making community and the sustainability science practitioner community. This chapter describes the methodological approach of the support action and its core outcomes.

34.2 Societal challenges of unsustainability

The wider policy, science policy, and science context is increasingly characterised by recognition of the growing number and urgency of major systemic challenges that societies across the globe are facing. These challenges are manifest in different ways in different contexts and at different scales, but they share common features. Their systemic aspect is especially important, since it is this that makes them largely immune to traditional approaches to finding solutions. Policy makers and scientists are increasingly aware that new approaches are needed to address these challenges and that, to be effective and efficient, solutions will need to be more holistic, systemic, and integrated, and developed in context together with the stakeholders concerned. This is indicated in the emergence of new styles of goal setting, policy making, and scientific support to decision makers and stakeholders.

Increasingly, policy goals are being set with reference to cross-cutting challenges. The focus within Europe on implementing the Europe 2020 Strategy, which aims at smart, sustainable, and inclusive growth, and the focus on addressing the grand societal challenges are in line with this general trend. So, too, is the effort at global level to define Sustainable Development Goals for the post-2015 period in relation to systemic

[70] In the course of reporting these core outcomes, the chapter makes reference to the evidence base that informed the recommendations. These include state-of-the-art reviews of science for sustainability in different countries or regions, illustrative examples of innovative and effective practices in the funding, management, conduct, and evaluation of science for sustainability, and several in-depth studies on specific challenges for sustainability science, such as interfacing. These are available on the action website: http://visionrd4sd.eu/

diagnoses rather than looking only at symptoms. More coherent approaches to policy making based on developing integrated policies that cut across hitherto separately addressed policy areas, such as poverty alleviation and habitat conservation, also reflect this trend. In order to support more coherent policy making, efforts are being made to provide more integrated scientific support. At the global scale, the new Future Earth project is working in this direction.

34.3 Science for sustainability

Problems of unsustainable development and societal challenges such as those outlined above are rooted in systemic failures, so they cannot be addressed successfully using specialised knowledge from any individual field. Also, both the problems and prospective solutions typically engage high stakes, vested interests, values, and uncertainties. A science for sustainable development that can take these aspects into account necessarily has to be different from conventional science, which is guided by rules and guardrails of specialisation, independence, controlled testing, replication, and peer approval by fellow scientists. Rather, a science for sustainable development entails working on problems in context with stakeholders and across conventional disciplinary and other boundaries, addressing problems through solutions, focussing on the bottlenecks of misunderstanding, incomprehension, and institutional brittleness, developing common understanding as a way of breaking through these, and using common understanding (rather than certainty) to agree on ways forward. Problems and solutions need to be managed adaptively through explicit experimentation. New inter- and trans-disciplinary knowledge will be co-produced in the process.

The needed science,[71] being very different from disciplinary science, makes special demands. It requires specific skills and associated research methods, tools, and processes for working across disciplinary boundaries, for engaging with stakeholders, for integrating knowledge, for producing new bodies of trans-disciplinary understanding, and for working towards transformative (systemic) change. But it is not only new scientific capitals and capacities that are required. There is a need also for more enabling framing conditions for science, including a deliberate sustainability orientation to science funding, new evaluation criteria for research proposals, projects, science organisations, and researchers, new forms of training and support for researchers undertaking sustainability-oriented science, and greater recognition and rewards for its practitioners, including enhanced career paths.

[71] The needed science is referred to variously by different groups and communities as Sustainability Science, RD4SD, and Interdisciplinary and Integrative Science, among others, but it has as a common theme the reconciliation of societies' development goals with planetary limits over the long term and the harnessing of science and technology in the quest for sustainability (see: Jaeger, 2009).

As O'Riordan et al. (2015) explain, there are examples of "tentative reaching out" by some pioneering research funding councils; but, for the most part, "researchers embarking on more integrative and imaginative procedures typically still face very considerable structural and methodological difficulties." Science for sustainable development [see Box 34.1] is therefore an emergent phenomenon that in the first instance is being supported by those who, in the words of O'Riordan et al., *"see its necessity and its intrinsic merits"*. Its champions "have to be prepared to experiment, to learn from failure, to understand and be sensitive to institutional bottlenecks, and to work progressively and cooperatively to overcome them" (O'Riordan et al., 2015).

Box 34.1 The Status of Science for Sustainability

Already, more than a decade has passed since "sustainability science" was established as a recognised research domain. The foundational work in the US and Europe (e.g. Kates et al. 2001; Clark, 2003; Weaver and Jansen, 2004) involved defining sustainability science in terms of main dimensions, characteristics, challenges, and distinctive features, and classifying it. Sustainability science is considered to lie in the category of "use-inspired basic research", the so-called Pasteur's Quadrant in Stokes' typology of science, and is regarded as "critical" science, as it challenges the status quo of prevailing development, policy, and scientific paradigms. Definitions emphasise its normative, systems-based, forward looking and transformative aspects and stress that uncertainty is an intrinsic feature of its subject matter.

Although sustainability science is now recognised as a research domain, its practices have developed through many disparate initiatives, carried forward by different scientists and scientific groups in many different contexts, often emphasising different methodological approaches, reference frameworks, themes, and perspectives. While the diversity and innovativeness of the scientists involved has led to experimentation with a wide range of tools, methods, and practices, the development has not been strategically coordinated or systematically and comprehensively studied and evaluated. Efforts among various small groups of practitioners reflect different topical interests. There is no overarching umbrella organisation bringing these strands together. The field is still characterised by fragmentation. There is therefore a lack of coherent evidence relating either to effective practices or to enabling framework conditions for effective practice.

(Source: Weaver, 2013, A European RD4SD Platform)

34.4 Methodological approach

Within this context VISION RD4SD was a joint effort by a network of 30 science policy partners and observers from 18 different European states supported by members of the community of European sustainability science practitioners. Together the action participants engaged in a dialogue aimed at exploring, collaboratively, the kinds of science that will be needed to support society in addressing the challenges of unsustainable development and in outlining practical steps that the two communities – science policy makers on the one hand and sustainability scientists on the other hand – can take to harness science for sustainability. The support action took a European perspective and was oriented primarily towards science policy making and research funding and management agencies of EU Member States, many of which were partners in the action. The action was contextualised nevertheless on a wider canvas of the widespread challenges of unsustainability that span multiple scales from global to local and affect societies everywhere, albeit differently and with manifestations that are context-sensitive. The support action therefore has a wider than European significance and its processes, methods, and outcomes are relevant for science policy makers, science funders, and science managers everywhere. They are relevant also for the global community of science-for sustainability-practitioners.

The core of the action was a structured dialogue among the science policy makers, funders, and programme managers. This was organised broadly along the lines of the methodology of Integrated Sustainability Assessment (Weaver and Rotmans, 2006; Rotmans et al., 2008) with repeated steps of scoping, envisioning, and pathway definition, each step being taken twice as part of an iterative sequence to allow also for evaluation, reflection, and adaptation. Scoping involved developing a joint understanding of the scope of the topic and the related problems. Envisioning involved developing a joint vision as a long-term orientation. Pathways involved exploring possible solutions, options, and science policy instruments to address the problems and realise the vision. Participants in this flexible and open forum exchanged experiences and developed a joint understanding of the status quo of science for sustainability in Europe. They identified challenges in undertaking this type of research, gaps in current practices, as well as opportunities for the way ahead. Regional and country case studies were undertaken by the supporting practitioners to provide participants with up-to-date information about the state of European science for sustainability, both in management and in practice. An overarching outcome of the dialogue was a joint vision on how to harness science for sustainability in Europe as a mid- and long-term orientation with strategies and road maps for joint EU-wide action as well as initiatives on research management reform processes to be implemented in the Member States. Recommendations were made also as input into the integration of science for sustainability in Horizon 2020 and for the realisation of the 2020 ERA Vision.

34.5 Vision and principles

At the heart of the vision of the role of science in supporting European sustainable development over the period to 2025, which was developed through the dialogue [see Box 34.2], is the objective to improve quality of life in Europe and globally. Global cooperation, transformed practices, good governance, and new ways of organising and implementing science and policy along systemic lines – with sustainability as a general orienting principle for science – are identified elements of the needed transformation in society and in the economy.

Box 34.2 The VISION of the RD4SD Action

> The improvement of quality of life lies at the core of policies dealing with science and innovation. In 2025 Europe is a catalyst and a world frontrunner of global cooperation towards this aim. In an era of growing complexity, in which there is an increasing ambition to live in a more secure, democratised and open world, there is an urgent demand for transformative but informed practices supported by good governance. New forms of organising and implementing science are based on novel ways of societal collaboration and trans-disciplinary knowledge integration and understanding. Implementing this vision requires a systemic approach in science and policy and, especially, new criteria and procedures for assessing scientific excellence. At its best Research and Development for Sustainable Development (RD4SD) will support decisive changes in individual behaviours and collective values and policies to transform our economy towards one that is sustainable and focused on addressing today's and future societal challenges and responsibly meeting the needs of all humankind.

Against the backdrop of this shared vision, the VISION RD4SD action articulated a set of eight principles to guide those involved in developing science policy or in designing, funding, or managing research programmes with a sustainability orientation. These comprise:

1. *Joint Agenda Setting in Research Programmes*: Research, development, and innovation programmes must be defined in collaborative processes that ensure the societal long-term ownership of science processes and products. Therefore RD4SD must be designed to allow for effective engagement of societal actors from business, industry, government, and civil society to identify the problems of unsustainability that should be addressed.
2. *Co-design, Co-production, Co-delivery and Co-interpretation in Projects*: Open funding procedures are needed for projects that engage stakeholders in the framing of the research and that allow, in a spirit of cooperation, the full integration of

knowledge and experiences of stakeholders as well as joint interpretation and communication of the results.

3. *Flexible and Adaptive Programme Management*: A great degree of flexibility and creativity is required in the management of RD4SD. For instance, pre-funding of research can ensure the formation of inter- and trans-disciplinary teams. Funding of separate, explicit phases of RD4SD – a scoping phase, an implementation phase, and a winding-up phase – can lead to a robust process that successfully addresses the intrinsic normative, complex, goal-searching, and participatory nature of RD4SD.
4. *Adapted Evaluation*: New approaches for proposal and project evaluation are required, since co-design with stakeholders means that problems and societal challenges need to be clarified ahead of and as a basis for all following R&D. Additional criteria for evaluation are needed, in particular to emphasize the societal relevance and need for outreach in RD4SD, since high scientific quality will not be enough. Furthermore, learning within projects has implications for mid-term project evaluation. Credit must be given for designing and running participatory, integrative processes.
5. *Systemic Approaches*: To tackle societal challenges, RD4SD needs to incorporate new trans- disciplinary perspectives that yield more complex analyses on the interactions of socio-ecological processes that occur at multiple scales, both in time and space. This entails more integrative, holistic, and cooperative approaches to R&D both in science and policy and a long-term perspective that includes the impacts of R&D on the welfare of future generations. An emphasis is needed on taking systemic perspectives and using methods that can better address complexity, trade-offs, multiple scales, non-linearity, and inherent uncertainty.
6. *Communication, Empowerment, Engagement, and Exploitation*: RD4SD findings must be accessible, accountable, and meaningful for diverse audiences to participate in, and actually empower them in their production. This means opening new opportunities for laypersons and many other often neglected voices to be involved in the implementation of integrated, systemic, and fairer solutions to global challenges. The knowledge to be elaborated through RD4SD needs to be socially and ecologically robust. This process of co-creation, co-delivery, and co-interpretation requires special facilitation, interfacing, and empowering skills that must be supported through project funding.
7. *Career Opportunities and Recognition*: To build up a solid new generation of experts in RD4SD, there is a need to provide career opportunities for both inter- and trans-disciplinary researchers. Academic institutions must give credit for challenging, complex projects and for designing and running dialogues and participative, integrative science-for-society processes. Reward systems in academia for inter- and trans-disciplinary research must be established and made attractive and transparent.
8. *Capacity building*: Harnessing RD4SD needs ongoing capacity building for funders and practitioners via training, a forum for exchange of experiences, and easily

available documentation of good practice. Management of transformative processes, system-oriented perspectives and inclusion of learning cycles, as well as positive leadership competences, are key elements of these capacities and their respective capacity building.

34.6 Towards a Platform for Experience Exchange

Through the dialogue process, participants to the action recognised that to meet the aims of the Europe 2020 Strategy and to address the grand societal challenges, a different kind of science will be needed as a complement to usual forms of disciplinary science: a science that responds to societal needs, is sensitive to context, is impact-oriented, and is transformative. It was recognised that the need for this new science is made more urgent by the economic and financial downturn, which also requires that the new science is practised efficiently as well as effectively. The action nevertheless highlighted that the integrating, interfacing, and transformative aspects of science for sustainability are particularly challenging for researchers and that significant gaps, both quantitative and qualitative, remain to be filled in existing scientific capacities in respect of how best to perform these functions. A recommendation, therefore, was to develop activities for building and strengthening science-for-sustainability capacities in Europe on a continuing basis and for developing a consistent reference framework for the practice of science for sustainability.

The action therefore makes the case for a formalised effort to learn systematically from science-for-sustainability experiences by identifying more and less successful practices and by studying factors (both contextual and methodological) that influence outcomes. There is opportunity for this. Different research approaches are being developed and deployed under different science policy frameworks, in many different contexts, and using many different methods, tools, and processes. So far, however, although there have been some small-scale studies to evaluate particular experiences, there has been no large-scale systematic effort to compare, consolidate, and integrate different approaches or to adopt a more strategic experimental design to examine and learn from these real-life “experiments”. A systematic effort would involve deployment of a consistent evaluation methodology to undertake comparative and meta-analysis of a wide range of case studies that represent different contexts, methods, and outcomes. Such an effort is needed to establish a reliable evidence base and to contribute to delivering a validated conceptual and methodological framework for the design, management, and evaluation of future science-for-sustainability programmes and projects. Ideally this effort should be on a continuing basis to provide for on-going experimentation, evaluation, learning, standard-setting, and improvement.

Continuity would also provide opportunity to develop a permanent basis for the performance of associated tasks and activities that are important for quality control and for establishing credibility and reputation for science for sustainability and its practitioners. The VISION RD4SD action recognised at least six candidate functions for a permanent science-for-sustainability platform:

- providing a stimulus for innovation and creativity;
- maintaining an accessible, interactive (web-based) structured repository of science-for-sustainability resources (a one stop-shop or clearing house function);
- facilitating open conferences, dialogue, reflection, learning, exchanges (of experiences, personnel, and resources from around Europe and around the world), transfer of good practices (and adaptation to context), and the development and consolidation of a community of good practice;
- establishing a pool of expertise and practical and policy advice for effective cooperation;
- training and capacity building in key skills and qualities required of science for sustainability;
- forming a European focal point for international (global) cooperation and exchange, potentially serving as a hub for a network of networks.

The development and implementation of such a facility would involve actors from the practitioner communities, science policy makers and funders, business, and civil society. It could take on any of several different organisational forms, including that of a physical or virtual competence centre, a network of excellence, a programme, or a platform. There is also the possibility of establishing a network of excellence involving a set of European national or regional centres working together through a joint programme of activities. The needed functions could therefore be performed by creating a new organisation or network or by integration into existing organisations or networks. The VISION RD4SD action suggested a European platform, but there is also the possibility that a European platform could be part of a broader international or global initiative and act, for example, as a regional hub in a global network. A European facility could, conceivably, also begin or coordinate a global initiative.

In this last respect, the VISION RD4SD action, importantly, is not alone in recognising the need for context-sensitive research into science-for-sustainability practices and their effectiveness. A recent report to the United Nations Office on Sustainable Development (UNOSD) acknowledges that: “the nature of knowledge and, with it, sustainable development knowledge is changing” and that “this has profound implications for the practice of sustainable development and for the process of building capacity to implement it” (UNOSD 2012). It states further that: “these changes combine with the emergence of networked governance, increasing the importance of boundary work, facilitation and mediation; and these underscore the need for UNOSD to develop its knowledge sharing, capacity building and networking activities and provide suggestive guidance for this development”. The report recommends, inter alia, that UNOSD develop (or identify) new, specialised tools and methods for knowledge management and implementation of sustainable development, help build capacity for managing and participating in networked governance, and train people on effective boundary work, which the report defines as involving managing the interfaces between science, policy, and stakeholder groups and building strong networks among the people in these groups.

The European Science Foundation Member Organisation Forum on Science-in-Society (ESFMOF SiS) has also recently concluded that Science-in-Society activities need to be analysed by research. "The embedding of Science-in-Society in diverse cultures is a fruitful field of research. A common European view on Science-in-Society and its practices needs to be elaborated with simultaneous consideration of the diversity of local and national contexts and situations… The definition and design of European science policy cannot be divided and managed only through thematic societal challenges and disciplinary actions. There is a need for an exchange of practices as well as themes from an academic point of view at European level and this might be one of the places where exchange could be developed across the globe" (ESF MOF Science in Society, 2012, pg. 26.) This last remark is also especially pertinent, since it points to the potentially greater value that could come if a European effort is part of a global effort.

In her recent book, Bammer (2013) also comes to similar conclusions about the need for a new style of science, the tasks involved in implementing this new science, the core competencies that are implied, and the need for reflexive processes so that lessons from practice can be used to inform future practice. Bammer calls this new style of science "Integration and Implementation Science (I2S)." She structures the needed competencies into three domains and, for each, reviews the state of the art. The three domains she identifies are: synthesising disciplinary and stakeholder knowledge, understanding and managing diverse unknowns, and providing integrated research support for policy and practice change. In a prospective section of her book, Bammer outlines a virtuous cycle between capacity, demonstrated success, and funding, which focuses on capacity building through reflexive evaluation.

34.7 Evaluation

Learning from experience is essential for competence building. This requires a dynamic and continuous interplay between past, present, and future practices mediated through reflexivity based on systematic evaluation, in context, of a diversity of science-for-sustainability programmes and projects in order to highlight general principles and distinguish these from factors that are context-specific. Evaluation – to establish which practices are successful and in which contexts – is key to identifying good practices and developing and spreading core competencies, just as it is for designing and evaluating research programmes and assessing research impact.

Approaches to evaluation and valuation (e.g. social valuation) of research and research outcomes have, therefore, become important topics of innovative R&D on the part of science policy makers, science funders, and scientists in the science-for-sustainability domain. Several research funding organisations have instigated work recently on methods and schemes for evaluating sustainability-oriented transdisciplinary research and on how to value its outcomes and impacts, including process outcomes when more tangible outcomes are not yet evident. At European level such organisations include the European Foundation Centre, the European Science Foundation, and the European Commission. At Member State level several national agencies have initiated studies into possible evaluation methods, such as the German Federal Environmental Protection Agency and Research Councils UK. A review of these initiatives and the approaches they have developed was undertaken by ICIS for the VISION RD4SD action and is available on the action website (see: Weaver, 2013, RD4SD-relevant evaluation practices).

In principle, those who have engaged directly or indirectly in organising, funding, or contributing to developing methods and schemes for evaluating science-for-sustainability activities are also candidate stakeholders in competence- and capacity-building initiatives, such as those proposed by the VISION RD4SD action.

34.8 Concluding remarks

Above all, the present chapter illustrates the need for self-reflection – or reflexivity – on the part of those involved in science for sustainability with respect to constantly examining the compatibility of the prevailing science policy framework with the special needs that science for sustainability implies, as well as evaluating the effectiveness and impact of research designs, the methods and approaches that are deployed in projects, and how the methods used are combined and tailored to the specifics of application contexts. It illustrates, also, the contribution that the Maastricht University and ICIS specifically is making to this process of constant improvement through initiatives in which it is involved, of which the VISION RD4SD support action is but one example.

The VISION RD4SD action has already had direct impact on its participants. The progress of the action was closely followed also by science funding and management organisations across Europe and more widely. Outcomes were posted on the action website as they were produced. Download counts for the main deliverables were running at several thousand by the time the three-year action had completed. In the short and medium terms such reflexivity is helping to secure improved framing conditions for science for sustainability and is helping to disseminate and upscale good and effective practices. In the medium to long terms this should help increase the relevance of projects, and leverage the positive societal impact of efforts across the wider corpus of science for sustainability. It has been suggested that this could also deliver spin-off benefits for impact-oriented science more generally, as science for sustainability is a front runner in making societal impact the touchstone of science efforts.

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Part VI
Science for sustainable development

Chapter 35

Research for sustainable development at ICIS: taking stock and looking ahead

Ron Cörvers and Joop de Kraker

Abstract

This chapter reflects on the research presented in this book and presents the ICIS2020 Vision on research.

35.1 Taking stock

In the first chapter, we introduced the concept of sustainable development and concluded that it involved multiple dimensions, levels of scale and types of actors. Is this complexity reflected in the 33 chapters that follow, reporting on research conducted at ICIS? And are there clear patterns or focal points in the way ICIS has addressed this complexity?

We planned and organised the chapters of this book according to the various dimensions of sustainable development: environmental, social, economic, and institutional. In hindsight, the question arises whether this was such a good idea. Looking at the distribution of the chapters over the parts dedicated to different dimensions, it would seem that research at ICIS over the past years has been very unbalanced in this respect. The environmental part consists of only three chapters, the socio-economic part of ten chapters, the political-institutional part of eight chapters, and in addition there are 12 chapters with a primarily methodological focus in the part on knowledge production. However, it is precisely due to the complex nature of the sustainability problems addressed in these chapters that it was difficult to decide where to place them, as in most cases they concerned multiple dimensions. Purely looking at the research topics, a different picture emerges, and it appears that a broad, diverse range of issues has been covered, including environmental (climate, biodiversity, water, energy, food, forests), social (health, labour, religious and cultural diversity, education) and economic topics (social economy, certification, business models). The chapters also cover virtually all levels of scale, from the local to the global, and are fairly evenly distributed in this respect. The same applies to the actors studied, which include individual consumers, companies, village communities, local and provincial authorities, national governments and global, international organisations. In conclusion, the research presented in this book covers the various dimensions, levels of scale and types of actors involved in sustainable development issues without concentrating on a specific dimension, scale and/or actor.

In the introductory chapter we not only described how issues in sustainable development are characterised by a diversity of dimensions, scales and actors, but we also emphasised that these elements interact with each other in numerous ways. Nevertheless, none of the chapters in this book has attempted to address and integrate all these elements and interactions for the issue they study. So, where is the integrative nature of sustainability science found in research at ICIS? There are several reasons for the absence of fully integrated studies in this book. To combine a broad overview with accessibility, the chapters had to be short and readable for non-specialists. This means that often only small parts of much larger studies or research projects are presented, pieces of a much larger puzzle supposedly presenting “the whole picture”. However, this certainly does not apply to all chapters. ICIS has developed from a centre conducting integrative studies commissioned by external clients to a scientific institute conducting research for sustainable development. In scientific research, the advancement of theories and methods is an important aim, and achieving this within the usual limitations of time and budget requires focus. The smaller the research project, e.g., an individual PhD thesis project, the narrower the focus must be, but even large projects with international consortia have a fairly narrow focus. This is not only for scientific reasons, but also because project proposals are written in response to well-defined calls from external funding agencies, focusing on specific topics (e.g., climate), scales (e.g., cities) and types of actors (e.g., urban planners). Despite this focus which arises out of necessity, the research contributions from ICIS are explicitly meant to be integrated with contributions from others in the quest for a more sustainable human society.

The wide variety of topics, levels of scale and types of actors addressed in the set of 33 research chapters may trigger another critical question: are there no focal points or unifying themes in research conducted at ICIS? Actually, there are. Not so much in terms of topics, scales or actors, but in the angles from which the issues are studied, the lenses through which focus is obtained. An external evaluation of research at ICIS about 10 years ago rated the productivity and relevance to society as very good and the research quality as good. The viability of the research programme was also rated as good, though at the same time as vulnerable due its relatively narrow focus on integrated assessment and its reliance on a very limited number of senior researchers. Since then, the senior staff has expanded and with them also the “knowledge domains” in research at ICIS, the scientific fields with distinct sets of theories, concepts, and methods which are used to obtain a better understanding of problems of sustainable development and to identify solution strategies. In addition to integrated assessment of sustainability issues (also known as “sustainability assessment”), two other knowledge domains can be distinguished in this collection of chapters, viz. innovation and governance. Whereas “assessment” is concerned with the production and integration of knowledge for sustainable development, “innovation” addresses the development and large-scale uptake of novel technologies, practices, and patterns of organisation in support of sustainable development, and “governance” deals with the establishment of policy arrangements, rules, regulations and agreements promoting sustainable development. From this point of view, about half of the chapters are in the “assessment” domain, dealing with methods, tools, or processes of knowledge production and integration, and the other half are in the “innovation” or “governance” domains. Again, a strict separation is difficult, because there are quite a few chapters in which these domains overlap.

35.2 Looking ahead

Although a pattern of three dominant “knowledge domains” can thus be distinguished in the research presented in this book, the overriding impression is nevertheless one of very broad variety. Since the last external evaluation, research at ICIS has clearly diverged into many directions. For a relatively small group, largely dependent on external funding in an ever more competitive arena, it seemed time to opt for convergence in its research. In 2016, discussions and reflections considering past and recent successes, strengths and weaknesses in expertise, and developments in research, funding and societal needs, have resulted in an ICIS2020 Vision on research, which describes the characteristics of research at ICIS in 2020 (see Box 35.1). These characteristics can often be traced a long way back in the history of ICIS, but at the same time have become more pronounced in recent research projects. They include the three core knowledge domains of assessment, innovation, and governance for sustainable development, but also a participatory approach to research.

As introduced in Chapter 1, sustainability problems are not only complex but also of a normative nature. The consequence of complexity is that the knowledge that science can contribute will be subject to severe limitations. The consequence of normativity is that knowledge alone is not sufficient to determine what the problems are and how they should be solved. In an open and pluralist society it also means that the diversity of values and interests of stakeholders should be taken into account. Research for sustainable development should thus be mindful of the limits to scientific knowledge and the diversity of stakeholder perspectives. A way to do this is through a transdisciplinary approach, which involves collaboration between scientists from different knowledge domains and societal actors, such as NGOs, governments, and companies. The development of integrated knowledge (assessment), novel products and practices (innovation), and new policy arrangements (governance) is then co-produced by multiple actors, including scientific researchers. Examples of multi-actor collaboratives aiming at integrated co-creation of knowledge, innovations and policies are the Living Labs. The study and further development of such labs in urban contexts is addressed in two ongoing research projects at ICIS, Urb@Exp (www.urbanexp.eu) and SmarterLabs (smarterlabs.uni-graz.at) which both use an action research approach. In this approach researchers engage with other actors in real-life "experiments", activities which are jointly planned, implemented, and evaluated. In sum, research for sustainable development at ICIS is expected to increasingly acquire the characteristics of a combined "assessment", "innovation", and "governance" focus, taking a participatory, transdisciplinary approach, often involving action research. The topics studied and sustainability problems addressed may vary according to the available expertise and funding opportunities, although a few dominant clusters can be discerned (Figure 35.1).

Box 35.1 ICIS2020 Vision: research at ICIS in 2020

A clear strength of ICIS research is its aim to combine academic excellence with societal relevance. Its orientation towards the broad field of sustainable development and its focus on policy makers and other stakeholders, contributes not only to the scientific debate about major societal challenges (e.g., in journal articles), but specifically also wants to be of practical relevance to policy makers and other societal stakeholders (e.g., by means of reports, guidelines, and toolkits for end-users, often developed through processes of co-creation). Another strength of the institute is its interdisciplinary and transdisciplinary research tradition, leading to innovative cross-overs and mixed methods at the interface of different disciplines to address sustainable development problems. ICIS researchers have also become more experienced in transdisciplinary research into sustainable development problems, especially through action research in urban contexts with policy makers and other stakeholders.

ICIS' vision is that research, education, and joint learning provide a knowledge base for policy making and innovation in pursuit of sustainability. Through its research, the institute wants to contribute to knowledge development, innovation, and action, and in this way intends to support sustainable development in particular places and contexts, especially at local and regional levels, as a basis for global sustainability. Starting from this ambition and building on promising research efforts from recent years, ICIS has developed a research framework to be applied to a limited number of sustainability challenges. This has resulted in a research agenda for the institute that is set until 2020. The integrative research framework is based on three interrelated knowledge domains, namely Assessment, Innovation, and Governance for Sustainable Development (see figure 35.1).

– *Assessment for Sustainable Development*, or Sustainability Assessment, is concerned with processes, methods, and tools to develop and combine knowledge from various scientific disciplines and/or stakeholders about a sustainability issue, such that integrated insights are made available to decision makers. The goal is the production and integration of knowledge, in order to better understand and address a sustainable development problem.

– *Innovation for Sustainable Development* is concerned with transformations in technology, organisation or behavioural patterns in order to address a sustainable development problem, or encourage fundamental changes that prevent the emergence of new sustainability problems. The goal is to learn from experiments and to provide trajectories for upscaling.

– *Governance for Sustainable Development* deals with collective action for the common good and focuses on how sustainable development issues are perceived and taken up by different actors within governance systems. The goal is to clarify actors' positions and interests and their interdependencies in governance.

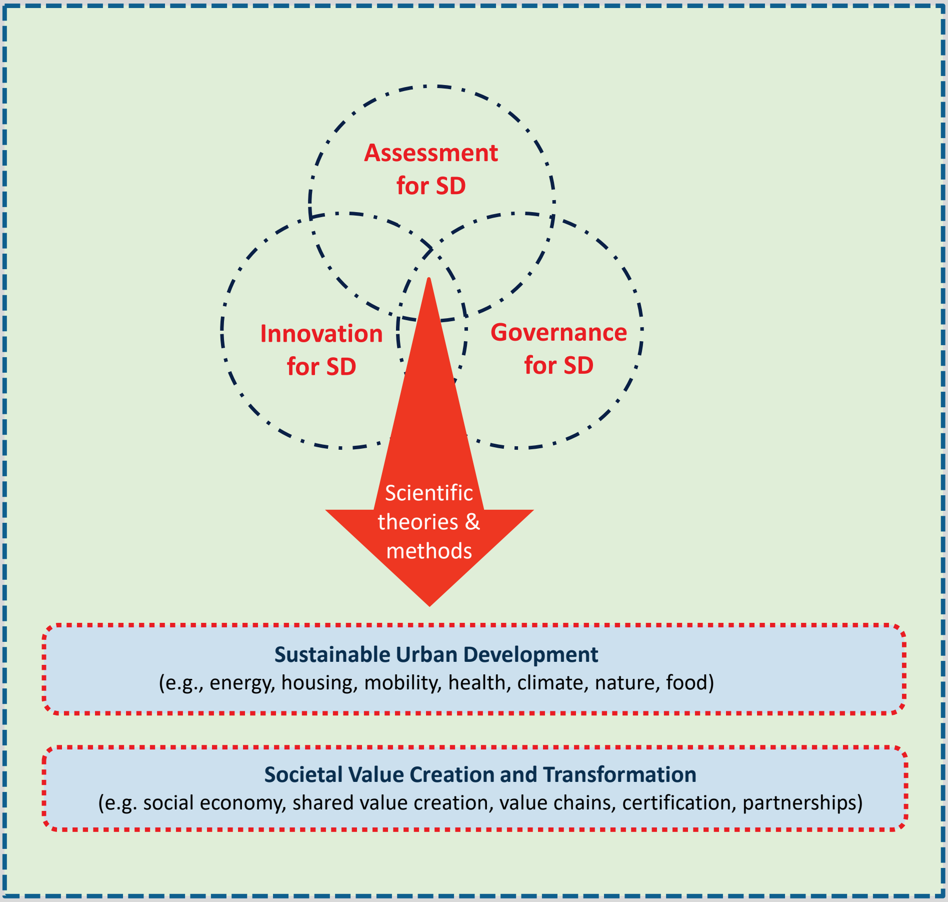

Figure 35.1 The ICIS research framework is based on three interrelated knowledge domains, which yield scientific theories and methods. These are applied – in co-creation with other actors – to societal challenges (e.g., Sustainable Urban Development, Societal Value Creation and Transformation).

By studying sustainable development challenges from these three domains or lenses in a coherent way, ICIS can contribute to problem structuring and analysis, can trigger innovative approaches, and can support policy making for sustainable development. In this way ICIS aims to span boundaries between science, policy, and society and support the capacity of public and private actors such as governments, businesses, NGOs, and citizens to steer development processes (e.g., urbanisation, technological change) into a more sustainable direction. Societal challenges currently being studied using this research framework are Sustainable Urban Development (e.g., energy, mobility, health), and Social Value Creation and Transformation (e.g., shared value creation, social economy, certification).

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Sjouke Beemsterboer researched sustainability assessments of concentrated solar power (CSP) and carbon capture storage (CCS) at ICIS. Sjouke is fascinated by the different arguments that are used to advocate or oppose developments in science, technology, and society. As a policy researcher and consultant he records and analyses the evidence that supports these arguments. This enables decision making based on a deeper understanding of the knowledge available, and with respect for its underlying value base. His goal is to support more robust and democratic policy making.

Carijn Beumer (PhD) has a background in culture and science studies. She wrote her PhD thesis at ICIS about perspectives on the conservation of biodiversity, focusing on the role of urban areas for the protection of global biodiversity. Carijn is currently working on transdisciplinary action-research projects with a twofold aim: first, to halt the trend of paving over domestic gardens in the Netherlands, and second, to co-create a solid body of knowledge about the potential role of domestic gardens in conservation, climate adaptation, urban sustainability, and health and well-being, by involving a large network of municipalities, organisations, centres of expertise, private partners, and citizens.

Julian Blohmke is a PhD researcher at ICIS. His research focuses on the relationship between society and environmental regulation, low carbon transition and innovation policy. He obtained an undergraduate degree in law and graduated in economics (Diplomvolkswirt) at the University of Hamburg. Previously, he was a research assistant at the Kiel Institute for the World Economy, and worked as an assistant economist at Berenberg Bank and as an economist dealing with renewable energy deployment in the MENA region. He advised the World Bank Environment Department and acted as a renewable energy expert consultant for the African Development Bank.

René Cimmermans studied at Delft University of Technology and works as a senior advisor for the Limburg Provincial authorities in the Netherlands. As a project leader, he was involved in the development (2012-2014) of the Provincial Environment Plan Limburg (PEL2014), incorporating the provincial authorities' vision on territorial and environmental development. The PEL2014 offers strategies for qualitative growth in an era of declining and ageing population. In these circumstances it aims at the highest possible quality level for the physical environment (including spatial planning, environmental management, nature, water, traffic, and transport). Since 2015 he has been responsible as programme manager for the coordinated implementation of PEL2014.

Ron Cörvers (PhD) is Director of ICIS, Associate Professor of Governance for Sustainable Development, and Education Director of the MSc Programme on Sustainability Science and Policy at Maastricht University. In addition to his management tasks, he is involved in research, teaching, and supervision of Master's and PhD students. His research focuses on governance for sustainable development and learning for sustainable development. He is currently participating in the SPIN (Scientific Programme Indonesia-Netherlands) project on global partnerships for the certification of agricultural commodities in Indonesia (www.munpop.nl), and in two European projects, URB@Exp on urban labs and urban development and SmarterLabs on living labs and smart transport technologies, all projects led by ICIS.

Joop de Kraker (PhD) is Associate Professor of Environment & Sustainability at ICIS. He combines this with a similar position at the nearby Dutch Open University. At ICIS, Joop is mainly involved with education in environmental sustainability and sustainability assessment, and with research on urban sustainability and sustainability assessment & learning tools. He is currently participating in two European research projects on urban labs (URB@Exp and SmarterLabs). His original background is in agri-ecological systems analysis and modelling, and he has worked for more than 10 years on a wide range of educational and research projects in the field of sustainable agriculture in Latin-America, Africa, Asia, and Europe.

Marc Dijk (PhD) is a research fellow at ICIS. His main research interests are innovation and innovation policy, sustainability assessment, and socio-technical transitions. He has published various articles and book chapters on innovation in electric mobility, Park+Ride, urban mobility, solar energy and resource efficiency. Marc was trained in aerospace engineering at Delft University of Technology. After a summer programme at the University of California (Berkeley), he completed a Master's programme in Science and Technology Studies at Maastricht University. He was a Visiting Research Fellow at Oxford University during the third quarter of 2012.

Lukas Figge started working at ICIS on the PhD project entitled Globalisation, Complexity and Sustainability in December 2011. The project involves an integrated assessment of global trends and dynamics, focusing on globalisation and the ecological footprint as a proxy for human ecological pressures. Lukas is a lecturer and tutor in the undergraduate course on Globalisation, Environmental Change and Society at University College Maastricht and in the Master's courses on Basic Modelling and Academic Writing & Presenting in the Sustainability Science and Policy programme at Maastricht University. Lukas holds a Bachelor's degree in Economics and a Master's degree in Public Policy, having specialised in sustainable development, both from Maastricht University.

Pieter Glasbergen (PhD) is Honorary Professor of Governance for Sustainable Development at ICIS-Maastricht University (2011-present) and Emeritus Professor of Utrecht University and the Open University, the Netherlands. He chairs the Maastricht-Utrecht-Nijmegen Research Programme on Partnerships (www.munpop.nl). He also chairs the SPIN (Scientific Programme Indonesia-Netherlands) project on the social and economic effects of partnering for sustainable change in agricultural commodity chains. His main research is on partnerships for sustainable development.

Nia Hidayat holds a Master's degree in Agricultural Economics from Bogor Agricultural University in Indonesia, where she is also a lecturer. In 2013 she joined ICIS as a PhD student in the SPIN (Scientific Programme Indonesia-Netherlands) project on the social and economic effects of partnering for sustainable change in agricultural commodity chains, in which she analyses the social and economic effects of palm oil certification on the livelihoods of Indonesian smallholder farmers. This research is funded by the Indonesian Directorate General of Higher Education (DIKTI) and the Royal Netherlands Academy of Arts and Sciences (KNAW). Her research interests include livelihood, sustainable agriculture, sustainable development, and farmer households.

Maud Huynen (PhD) holds Master's degrees in Environmental Health Science (2001) and Epidemiology (2003), and a PhD in Global Health (2008). She is a research fellow at ICIS, working on topics related to global and environmental health. She previously worked as a researcher and work package leader in several international and national projects exploring climate change impacts on health. Maud is the lead author of the 2009 ZonMw proposal for a national research programme on Climate Change and Health. She is currently working on the NurSus TOOLKIT project (www.nursus.eu). Additionally, she is conducting independent research into the health impacts of Dutch heat waves (HEAL project).

Muhammad Ibnu holds Bachelor's and Master's degrees in Agribusiness from the Bogor Agricultural Institute, Indonesia, and a Master's degree in Management of Agro-Ecological Knowledge and Social Change from Wageningen University, The Netherlands. In 2013 he received a scholarship from the Indonesian Directorate General of Higher Education (DIKTI) and the Royal Netherlands Academy of Arts and Sciences (KNAW) and joined ICIS as a PhD student in the SPIN (Scientific Programme Indonesia-Netherlands) project on the social and economic effects of partnering for sustainable change in agricultural commodity chains. His PhD work focuses on social and economic effects of coffee certification for Indonesian smallholder farmers.

René Kemp (PhD) is Professor of Innovation and Sustainable Development at ICIS and professorial fellow of UNU-MERIT in Maastricht. He is an expert on environmental policy, innovation policy, sustainability transitions, and eco-innovation. René has a background in (environmental) economics and innovation studies, and is a self-taught expert on the sociology of knowledge, governance for sustainable development and the political economy of innovation policy. As a multidisciplinary researcher, he has published in journals on innovation, ecological economics, policy, transport and energy, and sustainable development. He is an advisory editor of Research Policy, editor of Sustainability Science and editor of Environmental Innovation and Societal Transitions.

Sani Kosasih completed her Master's degree in Conflict Studies and Human Rights (2010) and in Social and Cultural Anthropology at the VU University in Amsterdam in 2012. She worked for two years as a PhD student at ICIS on the KNAW funded SPIN (Scientific Programme Indonesia-Netherlands) project on the social and economic effects of partnering for sustainable change in agricultural commodity chains. In her research she focused on the roles of Southern NGOs in relation to certification. In 2015 she decided to leave the Netherlands and ICIS to return to Indonesia.

Laura Kurth has been working as a PhD researcher at ICIS since March 2013. Her work focuses on the expression of religious diversity through the consumption of halal food in a secular context, taking a governance approach. Laura obtained her MSc in Sustainability Science and Policy at Maastricht University in 2012. She also holds a BSc in International Development Studies from Wageningen University, having majored in Communication, Technology, and Policy.

Martina Kühner is a PhD student at the Politics Department at Maastricht University. She is involved in a larger research project on soft governance tools led by Prof. Thomas Conzelmann, where she is contributing work on the authority of peer reviews among states in the field of sustainable development. For her PhD project, she is investigating the role of global monitoring mechanisms in facilitating the implementation of sustainable development goals. Martina is also affiliated with ICIS, Dr. Ron Cörvers being her second supervisor. Furthermore, Martina is a research fellow at the Earth System Governance Project.

Pim Martens (PhD) (www.pimmartens.info) holds the chair of Sustainable Development at Maastricht University and is an extraordinary professor at Stellenbosch University, South Africa. He is the (founding) Director of the Maastricht University Graduate School of Sustainability Science (MUST). Apart from his scientific work, Pim Martens is also a scientivist, aiming to contribute to a better, more sustainable society. Furthermore, he is the founder of AnimalWise a "think and do tank" integrating scientific knowledge and animal advocacy to bring about sustainable change in our relationship with animals.

Joana Mattei Faggin holds a Bachelor's degree in Agricultural Engineering from the University of São Paulo, Brazil (2003), and a Master's degree in Sustainable

Development, specifically social participation and sustainability in agrarian reform from the University of Brasília, Brazil (2009). She has working experience in NGOs and governmental institutions, including agrarian reform, social and environmental development, participatory methodologies and communitarian forest management. Since January 2014 she has worked as a PhD researcher at ICIS, funded by the CAPES Foundation (Brazil). Her research focuses on sustainable forest management as a strategy to mitigate climate change and desertification effects in the Caatinga biome in Northeast Brazil.

Astrid Offermans (PhD) holds a Master's degree (hons) in Interdisciplinary Social Sciences from Utrecht University and completed her PhD project about (changing) perspectives on water management at ICIS in 2012. Afterwards she worked on the INSPIRATOR project on successful joint knowledge production. Currently she is working on the SPIN (Scientific Programme Indonesia-Netherlands) project entitled "Global Certifying Partnerships" and supervises several PhD students on a diversity of research topics. Her research interests include knowledge production, methodologies for sustainable development, certification, perspectives, interdisciplinarity, and sustainability.

Bram Oosterbroek holds Bachelor's and Master's degrees in Environmental Sciences (2012), obtained at Wageningen University. He also completed a minor on Nature Conservation (BSc) and Geo Information Science (MSc) there. While working towards his MSc thesis and while being employed by a consultancy agency and a foundation, he further specialised in ecosystem services and the application of geo-information systems to model ecological and environmental phenomena. In May 2013, he started working at ICIS as a PhD researcher in the fields of ecosystem services, spatial modelling, human health, and biodiversity.

Reina Pasma studied biology and environmental studies at VU University Amsterdam and combines her job as an advisor and manager in regional and local government with work as an advisor and researcher at ICIS. At the Limburg provincial government, she was responsible for the integrated Provincial Environmental plans in Limburg (PEL2001 and PEL2014). She currently works as a strategic programme manager at the Maastricht municipal government, in charge of the implementation of the provincial environmental plan in municipal policies and the development of suitable policy arrangements. Furthermore she is responsible for the Southern Limburg regional urban agenda. She is affiliated to ICIS, connecting real-world policy problems of sustainable development to academic research.

Marjan Peeters (PhD) is Professor of Environmental Policy and Law at Maastricht University and is connected to both the Law Faculty and the ICIS institute. Her current research concentrates on EU environmental law and on comparative climate law – also in view of regulatory developments in China. She has also published in the field of renewable energy law and environmental procedural rights.

Ceren Pekdemir works as a PhD researcher at ICIS, where she also teaches the course on Governance for Sustainable Development in the MSc Programme on Sustainability Science and Policy. In her research, Ceren principally addresses the question to what extent and in what ways issue-specific governance systems for sustainable development are fragmented or cohesive in their institutional structures. In this context, she is particularly interested in the possible implications for the governance capacity of arrangements for sustainable development. Ceren holds a Master's degree in Conflict Resolution and Governance (UvA) and a Bachelor's degree from University College Maastricht.

Esther Sri Astuti received her Bachelor's degree in Economics from the University of Diponegoro, Indonesia, in 2000, and holds a Master's degree in Economics from the University of Indonesia (2002). In 2003, she joined the Institute of Management of the University of Indonesia as a researcher. In 2013 she joined ICIS as a PhD student in the SPIN (Scientific Programme Indonesia-Netherlands) project on the social and economic effects of partnering for sustainable change in agricultural commodity chains, funded by the Indonesian Directorate General of Higher Education (DIKTI) and the Royal Netherlands Academy of Arts and Sciences (KNAW). Her research concentrates on the economic effects of certification for Indonesian actors in agricultural product chains, focusing on the coffee value chain. Her research interests include agribusiness management, strategic planning, and applied economics.

Christian Scholl (PhD) is a post-doctoral research fellow at ICIS and coordinator of URB@Exp, an international research project on new forms of participatory urban governance and sustainable urban development. His research interests revolve around urban social movements and participatory democracy. Combined with a broad theoretical interest in political and democratic theories and urban and social movement studies, his expertise focuses on transnationalisation processes, global and climate justice, social movements, participatory forms of governance, and social control in urban contexts.

Serdar Turkeli is a PhD fellow at MGSoG/UNU-MERIT in Maastricht, conducting research into political economy and multi-dimensional governance of science, technology, and innovation (STI) policies. He worked on various international STI policy research initiatives at the METU-TEKPOL Science and Technology Policies Research Centre between 2006 and 2010, and completed coursework in PhD-level STI policy studies. He holds an MSc degree in International Studies in Engineering from the University of Duisburg-Essen, Germany, with an A-level thesis on international engineering and technology management. Serdar lectures in the "Innovation, Institutions and

Development" specialisation track of the MPP programme for ''Science, Technology and Innovation Policy''.

Anja van Bogaert is Managing Director of ICIS. She holds a Master's degree in Business Administration and from her initial interest in competencies for sustainability professionals, leadership, sustainable development, open innovation, and corporate social responsibility, her research interests have developed into ways of bridging the gap between science, business, and society and creating multiple shared values from an integrated holistic systematic approach, preferably through an open innovation concept and new sustainable business models.

Harro van Lente (PhD) is full Professor of Science and Technology Studies at Maastricht University. He graduated in physics and the philosophy of science & technology and holds a PhD in Technology Dynamics (University of Twente, 1993). Until 2014 he was Socrates Professor of Philosophy of Sustainable Development at ICIS. His research interests concern the way in which emerging technologies – such as nanotechnology, hydrogen, and medical technologies – produce novelties and needs. This involves technology assessment, foresight, politics of knowledge production, and philosophy of technology. Currently he is also Programme Director of Technology Assessment at NanoNextNL, the leading Dutch research consortium on nanotechnology.

Tim van Wanroij is project leader of Maastricht-LAB at the City of Maastricht, a co-creative development platform to experiment with new types of urban development in Maastricht (www.maastrichtlab.nl). As a project leader, Tim is responsible for all strategic and operational activities regarding experiments, activities, research, and learning trajectories in Maastricht-LAB. In addition, he is involved as one of the partners in URB@Exp, a research project focusing on urban labs as new forms of urban governance and sustainable urban development (www.urbanexp.eu).

Annemarie van Zeijl-Rozema (PhD) obtained her Master of Science degree from Wageningen University, The Netherlands, in 1995. She studied tropical land use and specialised in the management of natural resources. In 2011 she obtained her PhD at ICIS on Regional sustainable development: Barriers in practice. The main challenge she focuses on is to connect science and practice, and find ways of "doing" sustainable development. A key question is "How can science help us to deal with sustainability problems, which are inherently unstructured problems with no clear solution?". She uses her knowledge about integrated assessment, joint knowledge production, governance, sustainability indicators, and regional development to make a difference. Her interests cover both developed and developing countries.

Véronique Vasseur (PhD) is a post-doctoral research fellow at ICIS. She wrote her PhD thesis at ICIS (2014) on the role of government and users in the diffusion of solar energy in the Netherlands. Her interest is in technical innovations, social change, and the transition to a sustainable energy system. She is now involved in a joint research project funded by the NWO-JSTP. In this project, researchers from China and the Netherlands collaborate in research on energy efficiency for passenger transport and the energy use of urban households.

Jing Wang is a PhD researcher at ICIS. Her PhD research has mainly regarded sustainable agricultural development in China, including the assessment of policies, problems, practices, and perspectives, with a special emphasis on small-holding farmers' voices. She studied at Northwest A&F University in China, and holds a Bachelor's degree in Management and a Master's degree in Philosophy. In September of 2012, she started her PhD research at ICIS, with financial support from the China Scholarship Council (CSC).

Atika Wijaya obtained a Master's degree in Sociology from Gadjah Mada University, Indonesia in 2007. Thereafter she worked as a lecturer in the Department of Sociology and Anthropology at Semarang State University. She joined ICIS in May 2013 as a PhD researcher in the SPIN (Scientific Programme Indonesia-Netherlands) project on the social and economic effects of partnering for sustainable change in agricultural commodity chains, funded by the Indonesian Directorate General of Higher Education (DIKTI) and the Royal Netherlands Academy of Arts and Sciences (KNAW). In her research she focuses on the role of Indonesian governments in global certification partnerships on agricultural commodities. Her research interests include sustainable agriculture, governance systems, and public policy.

Paul Weaver (PhD) is a Professorial Research Fellow at ICIS. He is also an Adjunct Professor at LUCSUS, Lund University, Sweden. A graduate in Geography (Durham, 1978), Paul obtained his PhD in Civil Engineering (Leeds, 1984). He has worked previously both at Leeds and Durham Universities and at IIASA, Austria, and INSEAD, France. Over a thirty-year career, Paul has won funding for many projects and has acted in key roles as work package leader or principal investigator. He currently contributes to three FP7 Projects. He has authored several books (e.g. Sustainable Technology Development, Eco-restructuring) and written extensively about innovation and sustainability. He is currently on the Editorial Board of Sustainability Science.

List of Keywords

ICIS is Maastricht University's scientific institute for sustainable development. ICIS vision is that research, education and joint learning provides a knowledge base for policymaking and innovation in pursuit of sustainability. An important feature of ICIS research is its contribution to sustainability assessment. ICIS contributes to the scientific debate about sustainable development, but also tries to achieve a constructive social impact towards sustainability in practice.

This book presents an overview of the diversity and richness of ongoing and recent sustainable development research at ICIS in 35 short chapters, and it introduces the research agenda for the coming years. The book is intended for a broad audience of fellow researchers, collaborators from outside academia, students, and in fact everyone who is interested in learning more about the topics and types of research conducted at ICIS.

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