Chapter 1

Sustainable development research at ICIS

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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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