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| Author(s) | Rau, Henrike; Fahy, Frances |
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PART I

Measuring the Immeasurable? The Challenges and Opportunities of Sustainability Research in the Social Sciences



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Sustainability Research in the Social Sciences – Concepts, Methodologies and the Challenge of Interdisciplinarity

Henrike Rau and Frances Fahy

Introduction

The necessity to reconcile the needs and wants of human society with the limits of the global ecological system has resulted in proposals for alternative forms of development that prioritise human flourishing and well-being over materially intensive economic growth. Calls for development that is capable of sustaining more than seven billion people on a planet with finite resources and that ensures a good quality of life for current and future generations have shaped political agendas in the late twentieth and early twenty-first centuries. These practical and political sustainability issues are matched by equally daunting challenges with regard to its measurement. Who decides what counts as sustainable? How do we know if a new waste management policy or an initiative to encourage walking and cycling yield ‘sustainable outcomes’? What time frame is needed to assess the results of a policy that claims to enhance sustainability? Perhaps some outcomes will only emerge years after the sustainability assessment of a particular initiative has been completed. Finally, who are the ‘winners’ and who are the ‘losers’ of sustainability initiatives and policies, both now and in the future? These and other pressing questions are central to the sustainability project. However, they rarely receive adequate attention from politicians, practitioners and academics.

This edited collection aims to address some of these questions through a critical examination of new and established research methodologies and tools for social research that have found application in the investigation of sustainability problems. Its contributors can draw on extensive experience

and expertise with regard to both the conceptualisation of society–environment relations and the empirical study of people and places. Key methods to be covered in this collection include well-established quantitative and qualitative tools for social research such as survey questionnaires and focus groups. In addition, there is a strong emphasis on new and innovative methodologies that try to capture short- and long-term changes in human behaviour, such as problem-centred interviewing that focuses on key life events and longitudinal designs for the evaluation of sustainability programmes and initiatives. Overall, the book aims to help close a significant gap in the literature by offering an accessible and comprehensive account of current trends in the theory and practice of social-scientific sustainability research.

In this introduction we will examine past developments and current trends in sustainability research in the social sciences, concentrating in particular on contributions from sociology, geography and political science as well as recent inter- and transdisciplinary efforts. Initially, the main focus will be on the relationship between theory and empirical data. Subsequently, we will explore the (political) relevance and practicability of key approaches to measuring sustainability and sustainable human development. Following on from this, we will turn our attention to recently emerging inter- and transdisciplinary approaches to social research methodology and practice that represent interesting departures from more conventional ways of viewing and doing science. Throughout this introduction we will touch on some epistemological and methodological challenges inherent to social-scientific sustainability research in general, and recent trends towards greater disciplinary integration in particular. This discussion will encompass the potential benefits and drawbacks involved in combining social and natural science research methods. The concluding section of this introductory chapter will outline the overall structure of this edited collection and make visible the connections between individual chapters.

Linking theory and data: sustainability concepts and their measurement

There is still great uncertainty about the use of the term ‘sustainable development’ (SD) and its precise meaning: people who use the term in conversation or public debate may not necessarily talk about the same thing at all. The concept of SD has also had many critics who have taken issue with both its normative and prescriptive nature and its definitional breadth. Some have even described it as a paradox or an oxymoron whose deployment in the context of public and political debates is likely to perpetuate the existing discursive and practical hegemony of progress and economic growth (Sachs, 1997; Latouche, 2007). This raises the question whether conceptual agreement can ever be reached, given the diversity of ideas and

initiatives that are subsumed under the umbrella concept of sustainable development (see also Mebratu, 1998; Parris and Kates, 2003).

This said, many actors involved in SD politics, research and practice have more or less explicitly adopted the definition by the World Commission on Environment and Development (WCED), or variants thereof. The 1987 WCED report *Our Common Future*, also commonly referred to as the Brundtland report, is seen as a watershed moment in the history of sustainable development theory and practice. It defines sustainable development as development that ‘meets the needs of the present without compromising the ability of future generations to meet their own needs’ (WCED, 1987: 24). The Brundtland report recognises the various threats to society and environment that emanate from the over-consumption of resources and proposes measures to address this problem. While there is a strong focus on the role of the economy throughout the document, the role of politics in bringing about sustainable development is also explored in detail.

There are also proposals to substitute ‘sustainability’ for sustainable development to address (or perhaps avoid) some of the deep-seated conceptual uncertainties and ideological and moral tensions associated with the latter, many of which appear to resist any immediate resolution. We would argue here that concerns over sustainability can be traced back to pre-modern subsistence economies and traditional cultures but that by linking the issue of sustainability to modern growth and development logics, these older roots are frequently ignored. It is worth noting here that all of the contributors to this collection have adopted a nuanced and cautious approach to SD terminology which rejects the uncritical use of the word ‘sustainable’ but recognises the high importance of sustainability as a concept.

Regardless of the outcome of these conceptual debates, it is clear that sustainability research has gained huge momentum both in the social and the natural sciences, partly in response to the seriousness of social and environmental problems today. This raises important questions about the implications for social research of this ‘sustainability turn’. Surprisingly, this is hardly ever explicitly recognised. This lack of attention to fundamental methodological questions that arise from the growing influence of SD thinking more generally, and specific choices of sustainability concepts and terminology in particular, has been a key motivation for this edited collection and all chapters will cover these and related issues.

So what are the possible methodological implications of adopting either the Brundtland definition itself or one of its variants? Firstly, to do so means to also think about the issue of intergenerational justice and how to operationalise and measure it. How can we capture trends in human development and resource consumption that stretch across multiple generations? Are commonly used cross-sectional research designs adequate for the measurement of long-term change? And how effective are conventional social science approaches to longitudinal data analysis for the study of

society–environment relations? Ultimately, cross-sectional country data collected at regular intervals remain the dominant method for capturing and reporting social, economic and ecological change. At the same time, longitudinal data collection, that is, the recording of information over an extended period of time using the same sample (of people, households, organisations, etc.) continues to be the exception. This has significant implications for the analysis of social and ecological changes and how they occur.

Secondly, while the Brundlandt report and its various successors are explicitly global in focus, they nevertheless ascribe a significant role to the nation-state as a key administrative unit. While this clearly reflects the historical context of the WCED meeting in 1987, it has implications for the kinds of sustainability research that can be meaningfully conducted using this definition. National-level data continues to dominate mainstream sustainability research. While this focus on countries and their sustainability performance is useful on many levels, it cannot adequately capture many cross-national challenges to sustainability. As will be shown throughout this book, the growing complexity of global flows of people, goods, waste products and ideas and their capacity to transcend national boundaries cannot be ignored (cf. Rau, 2010). Importantly, this shift towards flows and mobilities brings to the fore wider issues about the adequate scale of social research as well as its generalisability, which will be central motives of this collection.

Comparative efforts are central to the investigation of sustainability, though there is great diversity with regard to the unit of analysis used. While classical comparative studies have often been cross-national in focus, there is now a much greater emphasis on ‘peer-group’ and regional approaches that group together individual nation-states. For example, Flynn’s (2007) recent comparative study of Ireland’s environmental performance adopted a peer-group approach that included three other countries: two that were seen as similar to Ireland (Portugal, Greece) and one that was judged to be different (Denmark). The many benefits of this innovative approach to sampling are evident throughout Flynn’s study and highlight the need to move beyond conventional frameworks for cross-national comparison.

Similarly, definitions of sustainability that deviate from or challenge mainstream SD concepts require alternative ways of thinking about and measuring sustainability. Many of the contributions to this collection will discuss alternative approaches to comparative research that differ from more traditional work in terms of scale, focus and choice of unit of analysis. For example, recent calls by academics and sustainability advocates for the (re) localisation of economic activity as a way of addressing social and ecological problems raise interesting questions about how to adequately measure the success (or otherwise) of small-scale initiatives such as Transition

Towns. Similarly, prominent sustainability studies have focused on cities rather than nation-states, which is also reflective of a renewed interest among social scientists in urban life.¹

It is likely that current and future challenges to the theory and practice of sustainable development will also change the measurement of sustainable outcomes. For example, it could be argued that a commitment to bid 'farewell to growth' (Latouche, 2010) would also imply a clear departure from established indicators and measurements of economic activity. In addition, certain topics that were previously confined to the margins of sustainability politics and research are now pushing through to the centre of debate, requiring the development of new indicators. For example, the impending threat of large-scale displacement of people both within and between countries due to climate change and associated environmental disasters can no longer be ignored. The implications of mass migration for global social and political stability, including the threat of social disintegration and the disappearance of indigenous cultures, have only recently received adequate attention from decision makers. In June 2011, UN High Commissioner for Refugees António Guterres urged countries to develop new approaches to climate-induced displacement of people. In his speech at the *Nansen Conference on Climate Change and Displacement in the 21st Century* in Oslo he referred to climate-induced movement of people as the 'defining challenge of our time' and criticised the lack of political will to tackle climate change.² This clearly has significant implications for the kinds of sustainability research projects that are needed to inform policy and shape public discourse. For example, it now seems vitally important to connect information about local and regional environmental degradation with migration data. Similarly, there is a need for more reliable and detailed information about the relationship between violent conflicts and environmental destruction, as well as more nuanced analyses of such data (cf. Salehyan, 2008).

To conclude, while more conventional approaches to data collection and analysis such as large-scale surveys are likely to remain dominant, partly because existing research capacity and infrastructure depend on their continued use, novel approaches can be expected to emerge to compete for recognition and funding. These include the increased deployment of visualisation methods aided by developments in information and communication technology, more widespread use of participatory and collaborative methods for data collection and analysis and modifications to conventional methodological approaches and tools to capture hitherto neglected social and environmental phenomena. However, the task of translating sustainability concepts into meaningful empirical observations will remain the ultimate challenge in the field. All contributions to this edited collection capture current practices in relation to the operationalisation of theoretical concepts and explore potential future developments.

Sustainability and Social Research: Methodological Challenges

The social-scientific measurement of sustainability throws up a range of questions to do with *what* to measure, *why* and *how*. Some of these questions relate to the nature of social research more generally, and have been central to methodological debates since the inception of many social science disciplines in the nineteenth century. These include methodological issues to do with objectivity and subjectivity or ways of assessing the quality of social inquiry. Broader questions to do with the nature of human knowledge, how people make sense of their social and physical environment and how they know what they know also continue to emerge in the context of social-scientific sustainability research, albeit often only as a subtext.

How we measure social and material conditions shapes and reflects how we think and talk about them. The rhetoric of measurability – the widely established idea that things do not matter (or perhaps do not even exist) if they cannot be measured – has influenced the sustainability debate in diverse ways. It seems important to remember here that the emergence of sustainability research in the late 1960s and early 1970s coincided with the rise of environmentalism and the re-emergence of Malthusian arguments with regard to population and resource consumption in many developed countries. Key research reports and academic publications such as Ehrlich and Ehrlich's (1968/2009) *The population bomb*, the *Limits to growth* report (Meadows et al., 1972) and its 30-year update (Meadows et al., 2004), the *Stern review on the economics of climate change* (Stern, 2006) and the various Intergovernmental Panel on Climate Change (IPCC) climate change assessment reports published since 1990 have fuelled and shaped the global sustainability debate.

What these publications have in common is a focus on quantifying and modelling the consequences of (un)sustainability. This methodological emphasis on quantification is also reflected in public debates that frequently revolve around directly measurable and numerically expressible aspects of environmental degradation. Predicted increases in global temperature as a result of climate change, or the anticipated rise in sea levels as a result of thawing pole caps and glaciers, have received significant media attention and have captured the public's imagination. Al Gore's popular documentary *An inconvenient truth* (2006) captures this type of sustainability discourse, which draws mostly on conventional large-scale quantitative data.

While there are countless benefits to using large-scale data and numeric indicators to investigate, represent and compare the sustainability performance of countries and regions, for example to draw attention to global inequalities, there is still considerable uncertainty about what indicators are most appropriate (see Khoo, Chapter 5 and Gaube et al. Chapter 6 in this

volume). The measurement of human development has long been dominated by economistic ways of thinking which prioritised economic growth and its measurement using gross domestic product (GDP) and gross national product (GNP). However, the dominance of economics has been challenged in recent years, in particular, following the onset of the financial crisis in 2008. Composite indicators of sustainability such as the Human Development Index (HDI) and the Happy Planet Index (HPI) have emerged and gained in popularity. This new generation of indicators combine a focus on economic activity with measurements of ecological improvement or decline, and human well-being. These alternative indicators thus reflect new ways of thinking about development which recognise that a continued focus on economic growth will destroy vitally important ecosystems and threaten humanity.

How can this shift in sustainability research towards more integrated indicators be explained? Even as recently as 1995 Kaufmann and Cleveland argued that lack of agreement between natural and social scientists about indicators represents a major barrier to sound sustainability research and that much greater integration is needed. Much has happened with regard to integration since Kaufmann and Cleveland published their work. Importantly, we record a rapid increase in the number of sustainability studies that purport to have adopted an interdisciplinary approach, that is, that bring together people from a variety of academic disciplines to study complex problems.³ While many of these studies claim to be theoretically, conceptually and methodologically integrated, few of them describe explicitly how this integration has been achieved. Some key issues of interdisciplinarity will be discussed in more detail in the next section.

However, many current approaches to measuring sustainability continue to overlook important social and cultural aspects, partly because capturing the latter requires alternative modes of social inquiry whose epistemological and practical features are distinctly different from mainstream methods based on quantification. Recent publications such as Juliet Schor's (2010) *Plenitude* and Helena Norberg-Hodge's (1991/2009) *Ancient futures: learning from Ladakh* as well as popular documentaries such as *The economics of happiness* (2010) have sparked interesting debates about cultures of happiness and human well-being, quality of life and localisation as a form of resistance to globalisation. Many of these contributions have adopted innovative methodological approaches that either complement or altogether replace more conventional methods with novel tools for researching the social world. For example, Helena Norberg-Hodge's (1991/2009) work on traditional Ladakhi culture and its exposure to modern global capitalism combines cultural anthropological fieldwork and ethnographic inquiry with action research elements, including 'reality tours' for members of Ladakhi society. These tours are intended to provide Ladakhi community leaders

with opportunities to experience first hand the merits and demerits of 'Western culture' and to potentially dispel common misconceptions among the Ladakhi about life in a highly developed country when the leaders return to their home region. These 'reality tours' included visits to a shopping mall, nursing home and municipal waste dump. The growing popularity of visioning techniques and backcasting workshops to tap into local knowledge and lay expertise in innovative ways represents another main strand of qualitative inquiry that is (re-)shaping sustainability research in the social sciences (cf. Quist and Vergragt, 2004; Davies et al., 2012).

Different methodological approaches in sustainability research do not only represent diverse methodological and practical options. They also reflect divergent ontological and epistemological views. For example, it is possible to distinguish between constructivist and (critical) realist strands that differ not only with regard to their methodology but also in *how society is viewed* and *how members of society are expected to interact with each other and with their biophysical environment*. Here, views of environmental problems as 'socially constructed' contrast with perspectives that emphasise the material realities of environmental (and societal) problems as well as their social causes and consequences. A researcher's commitment to a particular methodological approach, therefore, reflects their underlying ontological and epistemological assumptions, at least to some degree, though this is rarely explicitly recognised. Instead, many sustainability researchers appear to adopt a 'technical view' (Bryman, 1988) that assumes methodological choices to reflect pragmatic-instrumental decisions rather than broader concerns about the nature of human social life and its investigation.

Such a technical view has many advantages, including its strong emphasis on the practicalities of research as well as a potentially greater propensity towards mixing methods and unconventional and innovative study designs. However, its tendency to treat researchers' methodological choices as separate from their views of the social world and human behaviour, including people's interactions with the biophysical environment, can eclipse important tensions and divergences within sustainability research whose theoretical treatment could potentially advance the field. It is argued here that this lack of debate among sustainability researchers about the relationship between researchers' 'world views', which may be more or less compatible, and their methodological choices represents a serious obstacle to greater methodological clarity and enhanced harmonisation, especially within the context of inter- and transdisciplinary projects. It remains to be seen whether a fully-fledged, robust methodological debate will characterise the field of social-scientific sustainability research in the future, given its current focus on developing pragmatic solutions to sustainability problems and its leaning towards 'weak' interdisciplinarity.

Beyond disciplinarity? Efforts towards integrated sustainability research

The inherent complexity and multidimensionality of most sustainability challenges has called into question many existing disciplinary boundaries within the social sciences and beyond. But is it possible, or indeed desirable, to abandon disciplinary traditions to solve pressing social and environmental problems, as some social scientists suggest? If so, what are the consequences for existing disciplines, especially those whose prominence has somewhat waned over the last few decades? What innovations with regard to social scientific research are necessary to be able to study different forms of social and economic organisation *and* their material consequences? Efforts to answer these and related questions are manifold and reflect the diversity of the field. Some have defined sustainability research as a subdiscipline in its own right that connects different disciplines. ‘Sustainability is multiple things at once and navigates interesting territory – it is a goal, an ideal, an umbrella, *and a sub-discipline of multiple disciplines*’ (Stock and Burton, 2011: 1091, emphasis added). Social scientists who are actively engaged in national and international sustainability debates and research, including many of the contributors to this edited collection, thus adopt and advocate inter- and transdisciplinary work as a way of addressing the pressing problem of reconciling economic development with social equity and environmental integrity (e.g. Schor, 2010: 11). In other words, a commitment to interdisciplinarity is often seen as a necessary precondition for successful sustainability research: it is much less clear what this type of research is expected to look like and what ontological, epistemological and methodological foundations it is supposed to rest upon.

Undoubtedly, there are significant ‘hidden’ barriers to interdisciplinary collaboration, many of which only become visible during the actual research process. As mentioned in the previous section, these barriers may be rooted in fundamental differences in how researchers with different disciplinary backgrounds and training define the object, nature and goals of scientific inquiry. In other words, disagreements over methodological choices are rarely *just* about technical or practical matters. Instead, members of different disciplines may hold diametrically opposed views of human behaviour, the nature and composition of society and its dependence on natural resources. For example, fundamental differences exist both within and between major social science disciplines with regard to explanations of people’s actions and, by extension, their interactions with the environment. Sociologists, economists and human geographers may hold very different and at times incompatible views of the motives of human behaviour.

Similarly, different theoretical traditions in the social sciences are often underpinned by different and perhaps incompatible views of the human condition, including fundamental divergences with regard to the degree of rationality ascribed to human social (inter)action, the importance of societal structures vis-à-vis agency or the role of the individual within social organisations and institutions. By default, these different views exert considerable influence over a researcher's choice of research methodology, for example whether to focus on individuals' self-reported views and practices or to collect information about directly observable group behaviour. For example, consider the issue of (un)sustainable consumption which has major consequences for society and the environment. Here, rationalistic perspectives of consumers as 'utility maximisers' who make rational decisions based on complete information contrast with views that stress the culturally diverse and socially negotiated nature of everyday consumption practices, such as what people eat or how they move around. These views are in turn underpinned by disparate notions of the structures and functions of human society and its significance for individuals' attitudes and actions.

Fundamental differences in how human behaviour is viewed and conceptualised are not merely semantic; they also influence the choice of research methodology. As stated previously, questions remain with regard to the connection between a researcher's epistemological commitments and convictions, that is, what he or she considers to be an appropriate way of generating knowledge about the social world, and their methodological choices. Here, we could ask whether it is actually possible to decouple certain research methods such as choice experiments used by economists to measure consumer decisions from their theoretical-conceptual base, in this case a rational choice approach to human behaviour. Is it not the case that theoretical claims which focus on *meaning*, that is, the ways in which people make sense of their social and biophysical environment, require tools for empirical testing that tap into the nuances of these meanings (rather than establish their frequency or spread within the population)? Clearly, these and related questions represent a continuation and expansion of, rather than a break from, methodological debates in the social sciences around the issues of multi-method research and methodological integration (cf. Bryman, 1984, 1988). In fact, some of the current debates about the merits and demerits of interdisciplinary sustainability research closely resemble past debates among social scientists on combining qualitative and quantitative methods.

As interdisciplinary research has grown in popularity over the past few years, attempts have been made to divide or categorise interdisciplinary studies in line with their key features (e.g. Lyall et al., 2011). Recent categorisations include various distinctions between 'strong' and 'weak' forms

of interdisciplinarity, with the former describing work that links widely dissimilar social and natural science disciplines while the latter captures collaborations between members of cognate disciplines. Distinctions between interdisciplinarity and transdisciplinarity also continue to be debated. Although interdisciplinarity and transdisciplinarity have been used interchangeably by many authors, there are a number of important arguments in favour of distinguishing between them to achieve greater conceptual clarity. Recent contributions by Gertrude Hirsch Hadorn and colleagues on the nature and role of transdisciplinary sustainability research deserve particular attention in this context, because they show the enormous potential of projects that involve academic and non-academic research and knowledge communities and that focus on providing solutions to complex sustainability problems (Hirsch Hadorn et al., 2006, 2008; see also Costanza, 1997).

Yet others have gone further by asking whether academic disciplines should remain in place but work together, or whether they should be dissolved altogether. Some prominent social scientists have recently argued that disciplinary parochialism hampers the advancement of social scientific knowledge, and that the notion of disciplines itself needs to be challenged (e.g. Sayer, 1999; Jessop and Sum, 2001). This concern clearly resonates in Andrew Sayer's (1999) critique of disciplinary bastions in social research which informs his plea for postdisciplinarity:

I believe we should celebrate rather than mourn the decline of disciplines. We should encourage the development of not merely interdisciplinary studies but postdisciplinary studies. I believe this identification which so many academics have with their disciplines is actually counterproductive from the point of view of making progress in understanding society (1999:2).

Interestingly, these calls for greater disciplinary integration and overlap have been connected to broader debates around what constitutes 'normal' scientific practice (cf. Funtowicz and Ravetz, 1991; Hirsch Hadorn et al., 2006, 2008). While an in-depth discussion of post-normal approaches to science is beyond the scope of this introduction, it is important to note that arguments in the literature for a scientific paradigm shift towards post-normality have often resulted from scientists' engagement with 'wicked' sustainability challenges. Efforts to understand and potentially solve seemingly intractable social–environmental problems with very high levels of uncertainty and risk quickly revealed the limitations of conventional scientific approaches (e.g. Funtowicz and Ravetz, 1991).

The realities of sustainability research, policy and practice are often far removed from the twin goals of disciplinary integration and joined-up

thinking and problem-solving discussed above. As regards disciplinary input into policy, conventional economic contributions continue to dominate the policy landscape. In many policy contexts, including many of those found in Ireland, it seems almost impossible to influence policy decisions without providing estimates of potential costs and benefits as well as time frames for implementation. This clearly contradicts much sustainability research which shows that the benefits of sustainable solutions (whether financial or otherwise) may be indirect and difficult to measure or quantify and that they may emerge only after a prolonged period of time. Similarly, social-scientific efforts to study sustainability questions remain wedded to disciplinary conventions in terms of what kinds of questions to ask and how to answer them. This also coincides with a strong focus on large-scale quantitative work. Much work conducted in more conventional public and private research settings, including universities, state agencies and private research consultancy firms, remains firmly disciplinary in focus.

While inter- and transdisciplinary work carried out by research teams from the social and natural sciences undoubtedly remains the exception, some research institutes and centres have specialised in more integrated approaches to sustainability research. For example, major research institutes in Europe involved in sustainability research such as the Stockholm Environment Institute (SEI) in Sweden, the Potsdam Institute for Climate Impact Research (PIK), the Wuppertal Institute for Climate, Environment and Energy in Germany and the Institute of Social Ecology in Vienna (Austria) have adopted explicitly inter- and transdisciplinary approaches. This points towards a set of distinct problems that arise whenever a distinctly interdisciplinary field such as sustainability research is confronted with existing disciplinary-centred systems of knowledge production and dissemination, many of which have very real material consequences in terms of organisational structures, research funding and impact assessment.

Ultimately, the success or otherwise of efforts towards greater inter- or transdisciplinarity in sustainability research will depend on whether and to what extent funding structures, institutional conditions, quality indicators and output metrics used to measure the impact of scientific work can be modified to accommodate greater linkages between social science disciplines as well as between social and natural scientists. While the pressing nature of many social and environmental problems may raise doubts in some people's minds about the appropriateness of drawn-out debates on the merits and demerits of disciplines and discipline-specific methodologies, this edited collection sets out to show that the issue of disciplinary boundaries simply cannot be ignored because they go right to the core of sustainability research.

Structure of the book

This collection introduces scholars and students to a range of approaches to social research that are considered highly suitable for the social-scientific investigation of sustainability questions. Each chapter complements theoretical considerations with case study material and practical advice to enable readers to plan and conduct their own research and to engage in interdisciplinary conceptual and empirical work. The book assembles international contributions from social scientists whose expertise in the field of sustainability research is widely recognised.

There are three core themes that connect the different chapters in this collection. First and foremost, all chapters draw attention to the fact that the views and actions of individuals are both shaped by and reflected in their social, political and infrastructural context. This perspective challenges many conventional approaches to the study of human behaviour that assume people to be rational actors whose individual decisions and attitudes translate more or less directly into measurable behaviour. Many of the contributions to this book caution against approaches to sustainability research that uncritically embrace methodological and epistemological individualism and that conceptualise human social life as the mere aggregate of individual actions. Instead, there is ample evidence presented throughout the collection that synergies and interactions between individuals, groups and organisations across different temporal and spatial scales can produce outcomes for society and the environment that amount to much more than the sum of their parts and that require novel and innovative ways of doing research.

A second key theme revolves around two questions: how to conceptualise the relationship between societal development and resource consumption and how to effectively translate these concepts into suitable and effective measurements. Many contributions to the book stress the need to connect the study of human social life to assessments of its material foundations and impacts. This is perhaps one of the most significant challenges that social scientists working on sustainability issues face, both in terms of conceptual orientation and operationalisation. Most authors included in this book acknowledge that the ways in which societies use resources, including time, space and material objects, cannot be separated from the wider social processes that underpin them. For example, Gaube et al. (Chapter 6) provide ample evidence for the major link between societal organisation and resource consumption.

Thirdly, the collection draws attention to features of human behaviour that have significant implications for the environment and that have hitherto received limited attention. For example, Rau and Edmondson's chapter

shows that human behaviour is inextricably linked to time and that future sustainability research in the social sciences must take seriously the material effects of human time use. At the same time, they emphasise the need to examine the social and cultural meanings of time and their relevance to social organisation as a possible strategy for enhancing sustainability research and policy. Other contributors to the collection argue that a central task for social-scientific sustainability research is to connect more traditional social-scientific concerns with current work on the environment. Classic sociological themes such as democracy and public participation, the material conditions of social inequality or the contested nature of development cannot be treated in isolation from their material conditions; instead, their investigation needs to give adequate attention to both their socio-economic and their environmental causes and effects. While this 're-materialisation' of social theory and research presents considerable challenges, the contributions to this collection show that many traditional demarcation lines between the social and the natural sciences have become untenable and obstructive to sustainability thinking.

The book presents an extensive catalogue of methodological approaches and tools for social-scientific sustainability research and maps their deployment in concrete empirical projects. To group the different approaches effectively and to facilitate selective reading, chapters are allocated to three thematic areas: (1) work that focuses on the local level; (2) comparative studies that draw on different social and geographical units of analysis; and (3) investigations that give priority to time-related aspects of sustainability. We believe that each one of them captures a central area of current social-scientific sustainability research with regard to both conceptual orientation and methodological choice. Adopting this threefold structure represents an alternative approach to classifying social research that moves beyond more traditional qualitative/quantitative/multi-methods distinctions and dichotomies such as small- versus large-scale or positivist versus interpretivist. At the same time, this division into sociopolitical *and* time-space categories was deliberately chosen to acknowledge and make visible the critical departure from conventional ways of doing research that characterise much social scientific sustainability research today.

Part II covers methodologies and tools aimed at the investigation of attitudes and behaviour at the *local level*, that is among individuals, in families, households and individual organisations and within communities. All three chapters in this section demonstrate that a strong thematic and methodological focus on local- or micro-level phenomena can offer important insights into the development of social norms, conventions and processes and culture-specific views and practices that are much less visible at higher levels of social organisation. Importantly, a focus on the local explicitly recognises the significance of primary social relations, that is, those within

the family or community but also in work, for people's everyday social and material practices, and thus for sustainability.

Part III focuses on *comparative approaches* that measure the sustainability performance of cities, regions and nation-states. The contributors to this part of the book also attend to some pressing conceptual and practical issues that have affected the comparative investigation of sustainable development to date. An in-depth discussion of the contested nature of sustainable development as a concept as well as discernible convergences and divergences with regards to its measurement are central themes in this part of the book.

Part IV explores the issue of time and its significance to sustainability. Here, arguments are put forward for a critical, in-depth engagement with temporal dimensions of social and ecological change. This in turn challenges social scientists to move beyond more conventional research methodologies that are largely atemporal and indifferent to the complexities of time and to embrace new and innovative approaches that take time seriously. A critical examination of biographic and longitudinal research designs and their epistemological foundations forms a central aspect of this section of the book. The concluding section, Part V, presents a critical assessment of current and future trends in social-scientific sustainability research.

All three chapters in Part II share a concern for the local as the main focus of sustainability inquiry and explore the merits and drawbacks for both researcher and researched of social-scientific inquiries into local lives. In Chapter 2, Stewart Barr and Jan Prillwitz explore the ways in which sustainability researchers approach the challenge of understanding pro-environmental behaviours. They review how most research to date has focused on citizens and consumers, drawing attention to the challenges that arise when trying to understand the motives and actions of individuals. They argue that many debates within sustainability policy stress the importance of behavioural change as a way of tackling global issues like climate change. However, there is still relatively little known about the processes that lead to shifts in everyday consumption patterns, especially with regard to social influences on individuals' habits and practices.

Barr and Prillwitz also note the recent acknowledgement by researchers in the sustainability field that environmental behaviours occur in everyday contexts that involve others, and warn of researching individual pro-environmental behaviour outside of this context. Proffering households as the most exigent and 'important unit for analysis of sustainability', Barr and Prillwitz present a brief overview of the theoretical approaches that have traditionally informed research on household sustainability before turning to examine the various methodological approaches. Here, they focus primarily on the use of survey questionnaires as a means of recording individual

and household commitments towards the environment. They critically examine key theoretical and methodological concepts that inform the quantitative measurement of human behaviour, before detailing each stage of the survey approach. From framing appropriate aims and objectives, through survey design, construction and sampling, to implementation, Barr and Prillwitz's chapter provides valuable insights into each essential element of this quantitative research approach. Importantly, their contribution offers some practical advice for researchers in the field, such as what to do if a randomly sampled respondent is not home. While such detailed material is rarely found in traditional research methods books, it can be invaluable for researchers attempting to grapple with the practicalities of fieldwork.

Following on from their comprehensive and practical overview of the research process, Barr and Prillwitz draw on a recent case study of travel behaviour in the UK to illustrate the specific application of the survey technique. Indeed, such detailed descriptions of 'real-world' research projects are used throughout this entire collection, whereby authors introduce and critically examine individual case studies and projects to illustrate the benefits and drawbacks of a specific research technique or methodological approach. Barr and Prillwitz's chapter concludes with a brief exploration of the potential for survey research 'beyond the household as a unit for analysis defined by residential location' and a call for researchers to explore 'alternative sites of practice' if the survey-based sustainability assessment of households is to be advanced beyond its current remit.

The need for sustainability research to place individual's views and actions firmly within their wider social and political contexts forms an integral and recurring theme of the book. Anna Davies' theoretically framed examination of the merits and demerits of focus groups (FG) for the study of collective decision making (Chapter 3) demonstrates this very vividly. The contemporary prominence of public participation within sustainability strategies provides the context for her analysis. While the need for broad participation of society in sustainability decision making has long been acknowledged, it is only in recent years that researchers and practitioners have developed a suite of tools which specifically aim to address this 'deliberative turn' in sustainability engagement.

In her chapter, Davies first explores the wide range of tools and techniques to facilitate such participation. She examines critically how these tools and techniques vary with regard to type of engagement and the extent to which that engagement is connected to decision-making processes, before turning to focus groups as one such tool. Following a brief discussion of the nature of focus groups more generally as well as their methodological specificities, Davies purposely centres the chapter on the applications of the FG approach for sustainability and collective decision making. She provides a

critical appraisal of how the focus group approach has been adopted and adapted to the purpose of progressing sustainability in a range of geographical and administrative contexts. Specifically, this chapter reviews some recent sustainability-related studies that adopt a focus group approach before detailing a specific case study of the use of FG research in exploring public environmental values and planning for sustainability in the UK. Davies concludes that FGs certainly can provide a means through which social groups can be involved in decision making, but warns that if the outcomes or products that are formed during these processes cannot be accommodated within wider systems of governance, their impact will be limited at best.

Mark Garavan's chapter revolves around his experiences in the early- to mid-2000s researching and representing a community in North County Mayo in Ireland whose members have resisted the construction of a large-scale gas pipeline project. He argues for a dialogic approach to social research that takes seriously the concerns and voices of the participants and adopts a long-term view of human life and the research process. In addition, he cautions against efforts to exclude emotions from the research process because, while doing so may appear to reduce undue subjectivity, it also eclipses a major aspect of the human condition that is central to social inquiry. Garavan shows that local responses to the pipeline development involve culture-specific cognitive and linguistic efforts as well as visceral reactions by people who feel that the future of their place, community and livelihoods is under threat. This shows how local people's concepts of sustainability are often very different from rational-scientific discourses that dominate most sustainability debates. Instead they may involve feelings that cannot easily be articulated and that may only come to the fore whenever people are confronted with dominant discourses of 'development'. This poses some significant challenges to researchers who wish to capture and convey these culture-specific sustainability concepts.

Garavan refers to some existing ethnographic studies in sociology and anthropology to remind the reader of the culture-specific nature of concepts of rationality, which are often central to people's actions and protests. This allows him to connect his own work to major methodological debates that have influenced the investigation of cultures in the past and that remain highly relevant in the context of contemporary culture-sensitive sustainability research. Drawing on J.B. Peires' work, he is able to show that outside interpretations of unfamiliar social rituals such as the Great Xhosa Cattle Killing Movement (1856–7) are frequently inadequate and do not capture their culture-specific meanings. Culturally sensitive modes of inquiry, on the other hand, may produce accounts of protest events that capture both the why and the how. Garavan subsequently refers to Paolo Freire's work to make the case for a dialogic approach to social research that helps to address and potentially overcome some of the conceptual and methodological challenges that affect inquiries into local concepts of sustainability and their contestation.

Recent efforts to compare and contrast the sustainability performance of different cities, regions and nation-states are the focus of Part III of the collection. All three contributions offer a critical assessment of major conceptual and practical issues that have both helped and hindered the comparative study of sustainability. Naturally, a major focus of this part of the book is on the contested nature of sustainability concepts and indicators and their political relevance. In Chapter 5, Su-ming Khoo compares key indicators of human development and critically examines their connections with wider sustainability debates. Her detailed analysis of existing work in the field reveals some of the problems that have limited the applicability and usefulness of more traditional ways of measuring development. Many of these relate to the dominance of economistic thinking and its overemphasis on GDP, which has marginalised discussions about other significant areas of human social life.

Subsequently, Khoo argues that alternative ways of thinking and talking about sustainability such as the 'limits to growth' debates in the 1960s and 1970s have only partially captured the complexity of the problem, partly because these debates have remained firmly wedded to economic arguments. She also critiques how the dominance of narrow economistic approaches in sustainability policy has marginalised many qualitative aspects of sustainability, including people's quality of life and their capacity to reach their full potential and use their capabilities. Her discussion of alternative concepts and indicators of human development such as the three-dimensional Happy Planet Index (HPI) developed by the New Economics Foundation (NEF) and the notion of Ecological Space (ES) demonstrates both their advantages as well as limitations.

In Chapter 6, Veronika Gaube, Helmut Haberl and Karlheinz Erb examine key quantitative measurements of society–environment interaction to explore their suitability or otherwise for the interdisciplinary investigation of sustainability issues. Their chapter offers a detailed comparison of three internationally recognised environmental sustainability indicators: Material and Energy Flows Analysis (MEFA), Human Appropriation of Net Primary Production (HANPP) and Ecological Footprint (EF). All three indicators make visible the human consumption of natural resources both in numeric terms as well as through visual representation; however, they do so in very different ways. Through their systematic comparison, Gaube and colleagues are able to cast light on the usefulness, limitations and comparability of these three socio-ecological indicators. Importantly, they show how these indicators have become modified over time in response to changes in the nature and trajectory of society–environment interactions and subsequent shifts in their scientific measurement. This clearly demonstrates the highly fluid and dynamic nature of many sustainability indicators, a fact that deserves much greater attention than has hitherto been the case.

Drawing on examples from Austria's transition from an agrarian to an industrial society, Gaube and colleagues argue that complex interactions between society and the biophysical world can be only partially captured by methods that focus solely on the quantification of ecological sustainability. Moreover, it is evident from the discussion that the choice of indicator has significant implications for sustainable policy and practice, thereby contradicting proposals by some sustainability scientists for a decoupling of the politics and measurement of sustainability. They conclude their chapter with a plea for more inclusive indicators that incorporate environmental, social, economic and political factors and that could find application in different policy arenas.

Mapping as a tool for sustainability research enjoys growing popularity, partly because of the increasing significance of socio-spatial indicators of human development and its environmental consequences such as the Ecological Footprint (EF) or the Human Appropriation of Net Primary Production (HANPP) discussed by Gaube and colleagues in Chapter 6. Geographical Information Systems (GIS) enable the analysis and visual representation of diverse phenomena across a region – for example, topology, census data, or soils. Such information is vital for supporting sustainability planning. Indeed, there is now a substantial body of literature on the technological dimensions and the development of GIS-based sustainability indicators (see for example Carmichael et al., 2005; Ghose and Huxhold, 2005). In Chapter 7, Enda Murphy and Eoin King draw on their respective geographical and engineering backgrounds and expertise to demonstrate the importance of mapping as a method for assessing environmental sustainability. Situating their discussion at the city level, their chapter draws upon the issue of urban noise pollution as an illustrative example of the potential of mapping in sustainability research. Murphy and King discuss the link between noise pollution and environmental sustainability and review a number of key studies which have demonstrated that preservation of a good sound environment is important for the maintenance of public health, human well-being and a high quality of life.

Using the case study of Ireland's capital city Dublin, Murphy and King outline their approach to noise mapping and present some of their key findings. The authors conclude that graphical representations of environmental problems such as noise maps can serve to raise public awareness of major sustainability issues. They also highlight the transferable nature of these mapping techniques and their potential to identify and visualise trends in different types of social and environmental data, which can aid current and future understandings of sustainability issues and contribute to possible solutions.

In Part IV, Chapters 8 and 9 explore the many connections between time and sustainability, with a view to identifying areas of sustainability research,

policy and practice that require ‘temporalisation’. It is argued that while many conventional approaches to social-scientific research have remained largely atemporal, sustainability research clearly requires time-sensitive epistemological and methodological approaches. Melanie Jaeger-Erben’s contribution (Chapter 8) focuses on the impact of life events on consumption patterns. She argues that a longitudinal approach to the investigation of (un)sustainable consumption patterns can shed light on why and how people change their everyday practices in ways that cross-sectional designs cannot. These findings may open up opportunities for policy makers and sustainability advocates to tailor their efforts towards the promotion of more sustainable consumption patterns to people’s specific needs at various stages of their lives. However, Jaeger-Erben also shows that in some cases disruptions in people’s everyday routines caused by life events such as relocation or the arrival of the first child may in fact further entrench existing practices that may or may not have significant resource implications.

While time plays a central role in society–environment interactions more generally, it is particularly relevant in the context of current sustainability debates and initiatives. In Chapter 9, Henrike Rau and Ricca Edmondson put forward arguments for the further ‘temporalisation’ of social-scientific sustainability research, that is, for the development and deployment of time-sensitive methodologies and tools for data collection and analysis. Their contribution examines recent proposals in the sustainability literature for a much greater engagement with the issue of time use and its implications for society and the material world. Importantly, they show how time-sensitive qualitative approaches can reveal important information about the meanings people attach to temporal aspects of sustainability, such as the issue of intergenerational justice.

The diversity of insights and approaches to sustainability research provided in Parts II, III and IV of this book clearly indicate the immense contribution of social-scientific research to the investigation of sustainability problems. In the concluding section of this volume, Part V, we, the editors, summarise the key themes emerging from the preceding chapters and identify some of the future challenges regarding social scientific research in the sustainability arena. Increasingly, many projects in this field are expected to be policy relevant in their questions and outputs. In our view, the opportunities and challenges of undertaking policy-relevant research are integral to the future shaping of social-scientific contributions to the sustainability debate. Through our own experiences of working in this field, we conclude the edited volume with a critical reflection on the methodological challenges involved in undertaking policy-relevant research and consider how newly emerging methodological approaches in the field of sustainability can challenge expectations among many policy makers about how sustainability research should be done.

Notes

- 1 The FP7-funded project Sustainable Urban Metabolism for Europe (SUME) 2008–2011 exemplifies this new interest in urban societies, the built environment and broader issues of development (www.sume.at).
- 2 UNHCR, The UN Refugee Agency Press Release, 6 June 2011, <http://www.unhcr.org/4decc5276.html> (accessed 23 August 2011).
- 3 Note that definitions of the terms ‘interdisciplinarity’ and ‘transdisciplinarity’ differ significantly in the social sciences literature. In some cases, the two terms are used interchangeably. However, in this chapter we clearly distinguish between inter-, trans- and postdisciplinary work. Interdisciplinary research encompasses efforts to bring together researchers from different academic disciplines. The resulting exchange of ideas can be more or less detached from individuals’ disciplinary background. The term ‘transdisciplinarity’ is useful to label projects that involve academic and non-academic experts and knowledge communities and that focus explicitly on solving ‘real world’ problems (cf. Hirsch Hadorn et al., 2008). Finally, postdisciplinary approaches explicitly set out to challenge common forms of disciplinary parochialism and imperialism (cf. Sayer, 1999).

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