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Concepts and Challenges

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Foreword

Ulrich Beck, one of the most insightful and influential sociologists of his time, suggested original conceptual innovations that challenged sociologists, decision-makers, and the population generally. He was rightly criticized for several weaknesses and incoherencies of his analyses, such as his understatement of enduring social class divisions and of the power and vested interests in market dynamics. Nevertheless he captured many significant aspects of social constructions and their interaction with nature's constructions. Even the incoherent elements often refer to opposing tendencies that are difficult to reconcile. One conceptual contradiction in Beck's work is particularly helpful as a springboard for examining concepts and challenges in the interpenetration of society and nature.

In 1995 Beck (1995: 48–49) advanced a conception of the 'death reflex of normality' for communities near large-scale hazards (e.g. Seveso) that threaten to upend living conditions: 'as the hazards increase in extent, and the situation is subjectively perceived as hopeless, there is a growing tendency not merely to accept the hazard, but to deny it by every means at one's disposal …, there remains only the social construction of non-toxicity. It does not, admittedly, inhibit the *effect*, but only its designation …, staring into the abyss of dangers becomes integrated into normality'. Two decades later, anthropogenic hazards have become global and the scientific evidence of impending danger continues to mount and is widely disseminated. Environmentally degrading activities on one side of our

shared planet are starting to have harmful consequences on the other side and, because of their cumulative biophysical properties, are creating dangers for future generations. Fossil fuel combustion is particularly insidious because carbon emissions often have little effect on prosperous polluters but cause global warming that is threatening the distant, vulnerable poor who produce low emissions and future generations who haven't produced any. Such emissions are carried by wind and air currents and accumulate in the atmosphere to affect people distant in space and time from the principal polluters. Paradoxically Beck (2015) ignored his earlier concept of the death reflex of normality, and instead proposed conceptions of 'emancipatory catastrophism' and 'cosmopolitanism': the anticipation of global catastrophe prompts humans who are disproportionately causing pollution into taking the needs of others distant in space and time into consideration.

I would argue that the early Beck and the later Beck constructed two contrasting ideal-typical conceptions that capture opposing tendencies and possibilities. Either the anthropogenic unleashing of nature's autonomous hazardous dynamics results in dangers perceived to be too big and costly to solve; hence the hazards are denied or discounted on the presumption that future technology will enable humans to adapt to anything. Or they are perceived as too big and serious to ignore, hence the foreseen danger prompts humanity to free itself from the activities that threaten to unleash nature's harmful forces. The emancipatory ideal type is an aspiration found in policy discourse, such as the 2015 Paris Accord concerning climate change, and is approximated by material improvements in social practices principally in northern European societies. The path dependent normality ideal type, what I have referred to as sclerotic catastrophism (Murphy 2015, 2016) and what disaster sociologists (Turner and Pidgeon 1978; Vaughan 1996) have long documented as a 'failure of foresight' when confronted by inconvenient evidence thereby resulting in the 'incubation of man-made disasters', is approximated by high emissions per capita societies such as the United States, Canada, and Australia, which fail to implement environmental policies.

In the early stages of industrialization, whether in Eighteenth Century England or Twenty first Century China, pollution is mainly local and visible, which gives a material incentive to clean up the act, even if

somewhat belatedly. In later stages, a new type of pollution emerges largely invisible to the senses and causes slow-onset, distant harm. Ozone-layer depletion caused by CFCs and global warming because of fossil-fuel combustion require scientific measurement to know they exist, and media dissemination to spread this knowledge to the population. Invisibility to the senses facilitates denial and complacency. Remedies threaten to be costly and/or require life style sacrifices because fossil fuels have been the inanimate energy source of development and prosperity. Modifying social practices to achieve sustainability may in principle be reconcilable with economic growth, but in practice it is opposed by powerful vested interests, the population feels threatened by change, and the reconciliation is resisted. The benefits of emissions-free energy would accrue mainly to distant places or the future, whereas sacrifices by big and small polluters appear immediate and local. Skilled demagogues telling the population what it wishes to hear have an easy task, whereas impact scientists, environmental activists, and well-intentioned political leaders have a difficult undertaking. As Lockie and Wong (Chap. 15) argue, incorporating the future into contemporary decision-making is a significant challenge for sustainability, especially during periods of acceleration of path-dependent innovation. Oosterveer (Chap. 5) suggests a networks and flows perspective as most apt to incorporate time and place into social science analysis.

Schnaiberg (1980) persuasively contrasted production science to impact science, and Beck (1992: 234) referred to this dynamic as science opposing science. Corporations pursuing profit have used production science to develop innovative methods of extracting carbon from safe storage underground in shale, tar sands, deep water, etc., to combust it, and thereby emit it into the atmosphere. Impact science then measures how the carbon accumulates there for a century causing global warming, and documents its effect on the environment needed by everyone. Commodities like fossil fuels are extremely profitable because their pollution costs to the environment and human health remain unpaid by the polluter. If those costs were included in the price instead of being externalized, then polluting commodities would become expensive and used less (Fairbrother 2016; Yearley Chap. 7). But Davidson (Chap. 3) argues that if the metabolic value of nature and worker were correctly internalised,

there would be no surplus value, hence merely reforming capitalism won't solve environmental problems. So what will?

The biosphere amounts to a commons (Pellizzoni Chap. 13) that present and future generations share and is a medium that carries a social relation between risk makers and risk takers, for example between prosperous high polluters and vulnerable low polluters. Humanity, far from being a homogeneous entity, is rife with differences of power and interests. This results in diverse groups with divergent impacts on the biosphere and differential victimisation, as environmental justice research documents (Roberts, Pellow, and Mohai Chap. 11). Therefore speaking of the human impact on the biosphere, as in narratives about the Anthropocene, is an oversimplification (Lidskog and Waterton Chap. 2). Discounting future harm and priority given to near-term economic benefits to the exclusion of long-term needs constitute a structure of monopolisation (Murphy 1988) embedded in culture, practices, and even the physical infrastructure of the economy. "Long term" can be specified as the length of a human lifetime, about one hundred years, which corresponds to the time frame when global warming and other environmental problems are predicted to become severe.

An increasing population of high consuming humans, some more than others, is monopolising the biophysical resources of the planet. This appropriation of the habitats and bodies of other species is problematic in its scale. It deprives other species of resources they need to survive, which leads to high rates of human-induced extinction (Wiens 2016). There is a serious contradiction inherent in monopolising nature's resources and waste sinks thereby closing them off to other forms of life in that it threatens to undermine the very services that nature's other species and its autonomous dynamics provide free of charge for humans, which have empowered human development.

Acceptance that we are now in the Anthropocene does not give warrant to conceptions of the mastery of nature by human reason, nor that human ingenuity is replacing nature, nor does it support reliance on the premise that technological innovation will always give humans the capacity to adapt in a timely fashion to anything nature throws at us in reaction to human activities, such as global warming. Scientific proponents of the concept Anthropocene see humanity as at most a force presently equal in

impact to nature's processes. Even if humanity were to become the driver of planetary change, it does not imply that the cliff ahead has been eliminated. And it is equally possible that human activities are tipping the planet into new dynamics of nature's driverless transformations beyond human control. The fact that human activities are causing global warming and climate change, biodiversity loss, ocean degradation, emergence of antibiotic resistant bacteria, etc., implies that human activities could result in nature's forces becoming more threatening by unleashing increasingly powerful and frequent hurricanes, flooding, droughts, wildfires, earthquakes, ocean level rise, infectious diseases and the like. That is the concern of many scientists, both social and natural, who argue that sustainability in the Anthropocene requires that humans modify their deleterious impacts on their biophysical environment. The interaction and interpenetration of social constructions and nature's constructions are becoming more intense, not less so. Nature is an actant whose dynamics have the potential to strike back against its manipulation by humans (Clark 2011), which Davidson (Chap. 3) analyses using the concept of socio-ecological metabolism. The impact of human activities on their biophysical environment threatens to let loose a reaction of nature's powerful forces that could undermine many human activities. Unless remedial action is taken, the Anthropocene could be short compared to the Holocene, paradoxically ushering in a subsequent biophysical epoch where nature's autonomous dynamics would be more dangerous and less propitious for sustaining human life and prosperity.

The interaction of socioeconomic constructions and nature's constructions results in uncertainty rather than predictability. Although many overall tendencies are scientifically known and predictable, the specifics and timing are not. Fossil fuel combustion and deforestation causing global warming have been well documented, but the location, timing, and severity of resulting hurricanes, floods, wildfires, drought, etc., remain uncertain. This leads to not only nature's future dynamics that we know we do not know (known unknowns such as the extent and rate of ocean-level rise) but also to other forces of nature that we can't even image (unknown unknowns). And some forces are scientifically known but denied, as when American President George W. Bush claimed that the risks of hurricanes for New Orleans were unexpected, even though they

had been scientifically well documented (Freudenburg et al. 2009). This could be called unknown knowns, that is, known but unacknowledged, and is quite prevalent. Human activities are now having a profound impact by unleashing new frequencies and intensities of previously experienced biophysical forces and letting loose new constructions of nature. Facile assumptions that society can always withstand nature's forces (robustness) or adapt or bounce back or forward (resilience; see Ylönen Chap. 4) runs the risk of encountering tipping points into dangerous unknowns.

Nature's dynamics have repeatedly undermined the hubris of claims of mastering nature's forces for small scale phenomena. It is unreasonable to presume that such undermining could not occur on the global scale. Because nature's forces let loose by human practices are so powerful and global, even wealthy humans are threatened. At the least, the backlash by nature's forces puts human innovation on a costly treadmill to keep up with nature's constructions compared to the Holocene where nature's services could be counted on and freely harvested. At the worse, depending on technological solutionism could prove to be disastrous magical thinking because of nature's reaction to its manipulation. Promoting technological innovation is one thing, relying on it exclusively to circumvent modifying polluting practices is very different. If polluters believed their own rhetoric that technological innovations will solve pollution problems, they would be willing to accept technological solutions as preconditions for production, for example combustion of coal and oil only if there were no carbon emissions into the atmosphere. But such technological solutionism remains merely a talking point as carbon pollution intensifies.

Discourse is propagated by embodied humans both sustained and endangered by a material world of primal nature's dynamics. BP's discourse to American regulators that its blowout protector is failsafe was refuted by deep water pressures in the Gulf of Mexico where it failed to ensure safety (Freudenburg and Gramling 2011). There is so much greenwashing and clinging to the status quo that it is important to consider a possible death reflex of normality. Policy discourse is vacuous if it is not implemented into effective action. Rau (Chap. 9) argues in favour of practice-oriented sustainability thinking and assessment which would prompt more inclusive sustainability initiatives. Huddart-Kennedy and

Hauslik (Chap. 8) propose, in contrast to individualistic voluntarist approaches, a social practices framework which takes into account everyday structural arrangements based on internalized social norms as well as corporate and political structures. Ecological modernisation discourse concerning anthropogenic climate change will be valid if and only if practices change to make carbon emissions less than withdrawals from the atmosphere, otherwise global warming will continue to worsen (Murphy 2015, 2016). The important issue is whether socially constructed discourse leads to practices in harmony with nature's constructions or whether there is a mismatch (Adam 1995). Thus social science requires a material grounding and collaboration with impact natural science (Clark 2011). Since anthropogenic environmental problems have resulted from social practices and have social consequences, impact natural science similarly requires a grounding in social science. As Lidskog and Sundqvist (Chap. 8) argue, different kinds of expertise are needed.

Governance is key to determining environmental impacts, hence in a global world Mol (Chap. 6) argues that what he calls the environmental state must be outward looking and cosmopolitan. Fischer (Chap. 12) examines the theory and practices of the progressive/liberal and radical participatory versions of environmental democracy. Empirically, social democracy is not only a real-world leader in minimizing economic inequalities and inequalities of opportunity, but also a leader in environmental performance (see Murphy 2015). It deploys governments, trade unions, etc., to redistribute wealth and opportunity more equitably and typically is more inclusive of consideration of future generations and poor countries because of environmental considerations. Individualism and neoliberalism on the contrary foster monopolisation of opportunities and benefits by the prosperous of the present generation to the exclusion of others, including future generations, by pushing aside government and regulations. Van Koppen and Bush (Chap. 14) argue that sociopolitical fit is more difficult to achieve and needs our first attention compared to biophysical fit. But in the context of actual or threatened catastrophes, more progress may be made on both by giving them concurrent and equal attention.

Like Beck, I too would like emancipatory catastrophism to occur, but it is important to recognize it as aspirational. To transform aspirations

into reality and not degenerate into well-intentioned but naïve wishful thinking, it is necessary to understand the real imperfect world of power and privilege. This entails investigating sclerotic catastrophism, economic interests, short-termism (Adam 1995), and nationalism, which fail to take the welfare of future generations and distant populations into account. The backsliding of the Trump Administration in the United States concerning the urgent problem of anthropogenic climate change, and more generally its rejection of both natural scientific and social scientific expertise, is an example of the reflex of clinging to path-dependent normality. This failure of foresight in the context of scientific evidence of human-made dangers like global warming threatens to construct the incubation of catastrophe in the Anthropocene.

The renowned editors and authors of this timely and important book elaborate on themes such as these by focussing on specific concepts to increase understanding of the problematic relations between social constructions and nature's biophysical constructions and the interpenetration of the two. The editors Boström and Davidson (Chap. 1) insightfully saw the need for a critical analysis of concepts in environmental sociology, their integration with concepts used more broadly in the environmental sciences, and an interdisciplinary perspective. To its credit, environmental sociology has over the years continually studied social action by humans not only as embodied, but also in its material context of being sustained yet threatened by nature's dynamic, autonomous processes, which facilitates such integration and interdisciplinarity. This valuable book is environmental sociology's latest major contribution to the analysis of challenging socio-ecological relations.

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Acknowledgement

The seed of this idea—scrutinizing core existing concepts in the environmental sciences—developed from a growing conviction that we all need to reach a better transdisciplinary interchange on the terms, concepts and discourses that shape our thoughts and communication (or lack of thought and communication) on environment-society relations. This "we" refers not just to the authors of this book but, in principle, everyone within and outside academia. However, the concern among "we as authors" started as a worry that environmental sociologists a little too often continue to do research in a somewhat habitual way—formulating our standard questions, applying our favorite theories and methods, providing our standard critique—without sufficiently reflecting on, firstly, how our own discipline progresses in terms of theorizing, and secondly, how the concepts we use and ideas we formulate actually speak to the broader field and practice in environmental science and policy. And not the least, we reflected, this might also be the situation among several other disciplines within the environmental sciences. Indeed, in this broader field, scholars, policy-makers and practitioners often share the same concepts and express the same words—but do they actually mean the same things? Or what if they mean the same things, but fail to take notice of each other simply because they apply different concepts? While the incommensurability between disciplines in the sciences is not new, our concern was that problems like these are ever more problematic in

the face of the world's escalating environmental problems. More conceptual reflexivity and better communication—particularly between the natural and social sciences—are fundamentally needed.

Concerns like these resulted in the organizing of an international workshop, a collaboration between the environmental sociology section at Örebro University and the Research Committee on Environment and Society (RC24) of the International Sociological Association. Hence, a workshop on Core Concepts in Environmental Sociology took place at Örebro University, Sweden, in September 2015. It attracted around 25 environmental sociologists from 10 countries and 4 continents for a three-day long, engaging and intensive workshop. Several outcomes emerged from the workshop. In addition to individual papers, some of which were eventually published as peer-reviewed articles, it resulted in two major publications. The first one was a special issue on Conceptual Innovation in Environmental Sociology, published in the journal *Environmental Sociology* (Vol 2, No 4), edited by Rolf Lidskog and Claire Waterton. The second one is this volume.

We wish to send a big thank you to all participants who attended this workshop for their contributions to a friendly and constructive interchange. We hope all this will trigger a new, important conceptual discussion not only within environmental sociology but much broader in environmental science, and outside academia. The book hopefully manages to explain in further detail why we find this is so important.

We would like to send a thank you to all members of the environmental sociology section at Örebro University, who assisted by providing constructive comments on the book in different stages of the working process as well as on drafts of both the intro and concluding chapters. Particularly thanks to the following persons: Monika Berg, Karin Gustafsson, Erik Hysing, Rolf Lidskog, Erik Löfmarck, Sebastian Svenberg, Daniel Sjödin, and Ylva Uggla. A big thank you also to Henrike Rau who provided very constructive comment of a late draft of the intro chapter. As well, we appreciate the tremendous work of the staff at Palgrave Macmillan, who did a fantastic job of editing our work, and helping us get this volume to print.

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Abbreviations

ANT	Actor-Network Theory
CBD	Convention on Biological Diversity
CFC	ChloroFluoroCarbon
CDM	Clean Development Mechanism
CEO	Chief Executive Officer
COP	Conference of the Parties
CSDII	*Compendium of Sustainable Development Indicator Initiatives*
CSI	Citizen Science Initiatives
CSR	Corporate Social Responsibility
EF	Ecological Footprint
EIA	Environmental Impact Assessments
EPA	Environmental Protection Agency
EROI	Energy Return on Investment
ETS	Emissions Trading Scheme
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIN	Global Integrated Network
GVC	Global Value Chain
HANPP	Human Appropriation of Net Primary Production
HDI	Human Development Index
HPI	Happy Planet Index
ICT	Information and Communication Technology

IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
IPR	Intellectual Property Rights
ISPO	Indonesian Sustainable Palm Oil
JI	Joint Implementation
LCA	Life Cycle Analysis
LULU	Locally Unwanted Land Use
MFA	Material Flow Analysis
MEA	Millenium Ecosystem Assessmentt
MuSIASEM	Multi-scale Integrated Analysis of Societal and Ecosystem Metabolism
NEA	National Ecosystem Assessment
NIMBY	Not In My Backyard
NGO	Non-governmental Organization
OECD	Organisation for Economic Co-operation and Development
PROSA	Practice-oriented sustainability assessments
RSPO	Roundtable on Sustainable Palm Oil
SA	Sustainability Assessment
SDG	Sustainable Development Goal
SDI	Sustainable Development Indicators
SES	Social-Ecological System
SLCA	Social Life Cycle Analysis
SRA	Society for Risk Analysis
STS	Science and Technology Studies
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific, and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
WCED	World Commission on Environment and Development
WTO	World Trade Organization
WWF	World Wide Fund for Nature

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Introduction: Conceptualizing Environment-Society Relations

Magnus Boström and Debra J. Davidson

Our contemporary environmental crises have given rise to a fundamental question: will civilization survive? Maybe, maybe not, but we argue that our prospects for survival are significantly influenced by *how* that question is actually raised: what assumptions and worldviews are reflected in our questioning, and even more crucially, our answers. Those assumptions and worldviews tend to remain hidden within concepts, that is, more or less abstract ideas that are often treated as facts. Critical scrutiny of those concepts is needed both for understanding and for changing the world. Applying a critical gaze to the concepts that dominate discussions of environment-society relations allows for deeper reflection, leading to more fruitful communication and action. Through concepts, knowledge about a problem is formed and solutions are implicated. This book is not

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a call for new concepts. Rather, this book is written with a conviction that more reflexivity is needed regarding existing conceptualizations of environment-society relations, because these are currently shaping responses to environmental crises in fundamental ways. This reflexivity includes scrutiny of which concepts are used and how, and what assumptions and premises underpin them. Importantly, such reflexivity is needed in all spheres of society, including academia, policy and practice.

All too often, however, contemporary environmental politics and practice are guided by the opposite of knowledge and reflection; that is, ignorance, hyper-relativism, anti-reflexivity, alternative facts and denial. Nowhere are these trends more clear than in climate change politics. After decades of arm waving by climate scientists, climate change today features regularly in public and policy discourse. Some climate scientists might well be regretting this promotion to the front pages, however, as the politicization of science can be simultaneously good, bad and ugly: greater levels of awareness are a pre-requisite to collective action; on the other hand, scientific inquiry, and indeed many scientists themselves, have been subject to vehement attacks, spearheaded primarily by conservative think tanks linked to fossil fuel industries. This dance is, moreover, taking place onstage today in a tumultuous drama infected by alt-right inspired xenophobia, #alternativefacts, and massive and at times violent social unrest. What comes to the fore in this dance is the importance of words: is climate change a hoax? A catastrophe? A CO_2 management problem? Is it a risk or an opportunity? Who is to blame?

The choreography may be new, but the dance is not: our attention to environmental problems has always emerged through the concepts we embrace to comprehend society's relationship with the natural world. This observation would be of purely academic interest if it weren't for the fact that decisions are made on the basis of those concepts; decisions that have bearing on the well-being, and even survival, of present and future generations. Because these decisions are made less on the basis of 'facts,' and more on the basis of dominant and at times competing interpretations and meanings created and adopted by different societal actors, it behooves all scholars, decision makers, and citizens with an interest in environmental wellbeing to closely scrutinize these interpretations and meanings and those who produce them.

The purpose of this book is to scrutinize existing core conceptualizations of environment-society relations, to reveal the underlying worldviews and assumptions, and the means by which those assumptions and worldviews may (mis)guide our responses to environmental challenges. Through such scrutiny, we hope to create openings for advances in conceptualization that can inform dialogues, policies and practices in the environmental arena. The power to shape knowledge, interpretations and dominate public debate through the form of concepts or paradigms—is and has always been a core weapon in the battle for a more ecologically sustainable world. Scholars, decision-makers and citizens perceive, understand, explain, and solve environmental problems with the knowledge and discourses we have at our disposal. Raymond Murphy, in the foreword of this book, reminds us about the invisible nature of several of the most serious contemporary environmental problems and risks. This accentuates the need for knowledge, because we often cannot immediately perceive environmental problems by our senses. Even in cases when we actually can see, hear, or smell an environmental problem, knowledge is nevertheless necessary for the interpretations and inferences we make. Once upon a time, knowledge, particularly scientific knowledge, was held in high esteem. In today's (sometimes called 'post-truth') world, however, 'truth' is seemingly up for grabs. Large numbers of actors, both elite and not, have a tendency to believe whichever set of facts—or alternative facts—supports their worldviews. This seeming disregard for supportive evidence in the public sphere, and among elected officials, is certainly worrying. But it is also, we argue, an invitation for those of us who are concerned about environmental well-being to take a good look at the selectivity and partiality of our own analyses. The effective use of clearly defined concepts is an essential, and inevitable component of research in all disciplines, as well as among environmental experts outside academia, and we certainly do not ascribe to the naïve goal of objectivity. Rather, we argue that the employment of any concept must be done so consciously, coinciding with a critical understanding of the underlying implications of that paradigm or concept: which causal mechanisms are brought to the fore, and which are hidden? What does that concept imply about the relationship of society with the natural world?

Then again, some might ask, why bother? In a world of seeming chaos, where record-breaking world average temperatures, melting ice sheets, biodiversity loss and chemical pollution coincide with mounting military violence, famine, and the disintegration of stability in Western democracies, why write a book about concepts and knowledge at all? Hasn't humanity already passed the tipping point? The answer is, what do you mean by 'tipping point'? Regardless of the state of the planet and societies today, where we go from here has as much to do with the concepts we use to convey knowledge as has ever been the case before. To wit, given the current state of the planet, it behooves us to understand how concepts matter more than ever before. Which concepts are likely to support mobilization in favour of low-carbon transitions? Which concepts are likely to support further empowering corporations to govern themselves? Which concepts are likely to support dictatorship, and which democracy? Scholars, decision makers, environmental experts and citizen-consumers need concepts to understand the infinite and complex phenomena that make up the world around us, and how these phenomena link to the cause, distribution, and resolution of socio-ecological problems.

Science, policy and practice share the same concepts to a significant extent, presenting both an opportunity and a challenge in efforts to solve social-ecological problems. For instance, environmental scientists use theoretical concepts (e.g. resilience) to study environment-society relations, but the same or similar concepts appear as pragmatic concepts in the empirical world that environmental scientists study. A particular strength of the sociology of knowledge, and this is true of environmental sociology as well, is its thorough theorizing and acknowledgement of this dual character. Social scientists study concepts through concepts. What complicates the fact even more is that the subjects those social scientists study (people, communities, organizations, institutions) sometimes use the same or similar concepts that social scientists use when they study them. To give examples, the people who scholars study are themselves talking about social capital, social sustainability, culture, power, participation, institutions, the commons, externalities, resilience, the Anthropocene, and so on. Concepts not only represent our world, but are part of the shaping of that world (Rau and Fahy 2013). Institutions such as Bretton Woods, UN, IMO, WTO, UNEP, IPCC have been shaped by

theories and concepts such as Keynesianism, Human Rights, Neoclassical economics, Sustainable Development and many more (White et al. 2016). Lidskog and Waterton (2016a, p. 308) explain: "Concepts do something with the world. They are navigational (directing our attention), normative (shaping our priorities) and performative (guiding our action)." To further complicate the matter, the environmental scientist is also him- or herself part of what (s)he studies—a situation social scientists call 'double hermeneutic' (Giddens 1984)—although this is not always acknowledged or appropriately understood in environmental science in general.

Concepts used to understand society's relationship with the natural world have been featured in academic discourses for over a Century. But these have taken some notable shifts over the past decades, with the introduction of new concepts, and the discard of others. The conceptual treatment of the environment across the academy has been especially dynamic in the past decades. Some reflections are warranted on what those conceptualizations tell us about how we are thinking about and treating the environment in the twenty first Century. The 1960s saw the emergence of concepts such as Ecology and The Tragedy of the Commons, and powerful metaphors like Silent Spring and Population Bomb. In the 1970s came Limits to Growth, subsequently subjected to heated criticism and debate. These debates focused attention on population growth, pollution, scarcity of natural resources and the role of economy and technology. The key global concept introduced a decade later was Sustainable Development, which countered the Limits concept with a more optimistic view of economic development, albeit one that attempted to transcend old Enlightenment stress on eternal progress, growth and prosperity. Rather, development was to be seen as something to be (and which *could* be) balanced with concerns for the environment and social justice. Environmental protection and equity were now to be seen as both global current affairs and concerns for future generations (see Rau, this book). Environmental consciousness increased, and citizens of the 1990s began to count the size of their Ecological Footprints and engage in Green Consumption (see Huddart Kennedy and Hauslik, this book). The tragedy of the commons, ecological footprints, tipping points and the hockey stick have become part of the vocabulary in public debates. And at least

since Elinor Ostrom won the Nobel Prize in 2009, environmental social science has enjoyed a more prominent place in the debate; her Common Pool Resources concept is added to the battery of popular frames (see Pellizzoni on the 'commons', this book).

Around and after the millennium new concepts, originating in Academia, entered the public sphere and we learned to look at the world and nature in terms of Resilience (see Ylönen, this book), Transition, Planetary Boundaries and the Anthropocene. These concepts and discourses, emanating from numerous disciplines engaged in environmental studies and sciences, have had tremendous influence not just on the academy, but importantly, they also have a bearing on popular and policy discourses and practices now more than ever before, particularly in climate change debates. The growing popularity of the concept of the Anthropocene for instance (see Lidskog and Waterton, this book), which postulates that humans are now the driving force of geological change, reflects a growing consciousness of the capacity of humans to produce global environmental changes. It also, perhaps paradoxically, justifies drastic human interventions like geo-engineering.

Through these concepts many stories are told about environment-society relations, as problematic, disastrous, catastrophic, or merely inconvenient. Questions arise, however, about how concepts could facilitate learning about environment-society relations in ways that are more insightful than the many simple statements on how 'society' causes too much population, consumption, production, capital, exploitation, extraction, pollution and so on. Paradigms narrow our gaze, and thus not surprisingly they tend to polarize, as between neoliberal Promethean optimists and Malthusian 'end times ecology' pessimists (White et al. 2016). In one camp, nature is the problem and society (science, technology, market) the solution. In the other camp, society is the problem and nature the solution. Debates within the field of environmental sociology, such as the one between Ecological Modernization vs. Treadmill of Production (described later) are a microcosm of these broader debates.

This book offers appraisal, problematization, and critiques of many contemporary concepts in environmental parlance. Most of our contributors emanate from environmental sociology, a sub-discipline well-suited to offer such critique. One of the founding fathers of environmental

sociology, Riley Dunlap, defines environmental sociology as 'the study of societal-environmental interactions' (2015, p. 796), and the perspectives of environmental sociologists on contemporary conceptualizations of environment-society relations have much potential to enrich academic studies in the wider field (see also Brulle and Dunlap 2015). Throughout this volume, despite variations in concepts and approaches, all chapter authors join in a common desire to grapple with how we—scholars, decision makers, citizen-consumers, and environmental experts (see Lidskog and Sundqvist, this book)—think and talk about the natural world and our role within it, with an eye toward directing these discussions toward pathways that support transitions toward ecological sustainability (or toward socio-environmental resilience, post-carbon societies, the green utopia, or whatever concept that readers prefer to describe the goal). Thus, each of the chapters included will review and discuss a particular core concept and related subconcepts in use in the environmental sciences, including consideration of their limitations, their contributions to our general understanding of environment-society relations, and the implications of their manifestation in the political sphere and practice.

We have an additional objective, however, in putting together this edited collection. The authors of this book work within or close to the field of environmental sociology. While we have chosen to pursue an interdisciplinary path in academia, our sub-discipline would appear to have evolved into a field of scholarship as internally-oriented as any other, so entrenched are the silos of academia. Our own theories and concepts have in many cases been developed in parallel to and yet in isolation from other major debates in environmental science and politics. For this reason, we purposely chose to focus our attention not solely on concepts within environmental sociology, but rather concepts that appear to resonate throughout the environmental sciences and beyond, in hopes of facilitating greater transdisciplinary exchange, and by doing so, call on all scholars in the environmental sciences to enhance our capacities to engage in cross- and transdisciplinary discussion and debate. There are already several concepts frequently used in this broader cross- and transdisciplinary debate such as sustainability, resilience, planetary boundaries, risk, governance, democracy, economic valuation, and tipping points. Yet, too often such concepts are referred to in a superficial manner

without consideration of basic assumptions, so what better place to start a more serious interdisciplinary conversation? Kasper (2016) notes that the differentiation between disciplines and sub-disciplines is both an opportunity and a challenge in environmental sciences. It enables specialization, yet the benefits of this specialization become constraints because of the siloed nature of our disciplinary structure. Rather than facilitating shared understanding of society—environment relations, it limits such understanding.

Why Concepts?

Scholars and other actors both understand and misunderstand each other through paradigms and concepts. 'Paradigm' denotes a set of concepts and practices that defines and encircles a scientific field for a particular period. Paradigms are relatively resistant to change brought about by 'anomalies'; that is, allegiance to a paradigm may persist despite the accumulation of conflicting evidence. Different paradigms are hence unable to communicate with each other; they are incommensurable. While Kuhn's theory of paradigms has been debated intensely since the publication of his book *The Structure of Scientific Revolutions* (1962), the idea of paradigms is nevertheless useful as a heuristic frame to discuss barriers and opportunities for achieving a cross- and transdisciplinary environmental science. Such an endeavor would require avoiding the development and bolstering of separate paradigms, unable to speak to each other, such as those between a social science-oriented and natural science-oriented environmental science.

'Concepts' are potentially more flexible and open-ended, and thus better able to facilitate interchange across disciplines. From a 'post-Kuhnian' perspective, Hjorland (2009) addresses four different sources of conceptualizations. Concepts may derive from systematic observations based on the clustering of similar objects (empiricism), from logical reasoning and theorizing (rationalism), from the historical, cultural, discursive, and social context (historicism), or they may be future-oriented, derived from goals, values and aspirations (pragmatism). For the purpose of this book, it is crucial to uphold the assertion that concepts are not only derived

from the scientific enterprise but involve broader contexts, including pragmatic policy- and goal-oriented activities.

Paradoxically, concepts need to 'fixate' something (Hjorland 2009), while also adapt to various situations (Prinz and Clark 2004). Some level of stability is a prerequisite to be able to think, communicate, and act upon something. Fixating something means both including and excluding some elements. For example, 'sustainable development' excludes 'unlimited economic growth'. However, 'sustainable development' at the same time needs to provide for some level of 'interpretative flexibility' because such flexibility may be a prerequisite for separate groups and conflicting interests to enter a dialogue and negotiations (Hajer 1995).

Through the use of concepts we draw attention to and interpret phenomena: problems and solutions, risk and safety, justice and injustice, opportunities or barriers, potential futures and crucial legacies, general patterns and local variations. A focus on concepts invites several questions with which the contributors to this volume engage, including three sets in particular, elaborated upon below.

A first set of questions concerns the explanatory power of the concept: Is it apt for understanding and describing environment-society relations? Does the concept primarily look at ecological or sociological factors, or does it take into account interaction dynamics? Is it sufficiently precise, or comprehensive? Many concepts, for example, tend towards social or ecological reductionism, or mono-causal explanations (see conceptual traps, next section), which give precedence to certain institutions, such as capitalism, markets, social movements, or nation-states, potentially exaggerating their influence. Concepts also differ in their theoretical accounts of agency, change, and inertia. Some concepts are better than others in identifying the most crucial barriers and path-dependent structures.

A second set of questions addresses possible social, cultural, or geopolitical 'biases' and 'blinders' inherent in various concepts. Are concepts developed to be globally relevant (see Oosterveer, this volume) or are they really only germane for a particular region of the world (e.g. Europe)? Or of a particular generation, ethnicity, class, or gender (compare Roberts et al., this volume)? What remains unseen when someone 'sees' environmental destruction through the lens of economic valuation (Yearley, this volume)?

A third set of questions concerns the action-potential implicated by the concepts. Many concepts shape action (understood as performativity), intentionally or unintentionally. Does the concept generate openings for vision, imagination, politics, innovation, institutional design, for taking action, for identifying transition pathways? Who are the implied change-makers? Are these agents human? To whom do the concepts speak: academics, elite decision-makers or citizen-consumers? All concepts embody frames that resonate with certain audiences (ability to 'speak' to various audiences, see Snow and Benford 1988) more than others. Will the concept of 'resilience' (see Ylönen, this book), rather than the neo-marxist concept 'treadmill of production,' have a better reception when scholars speak with elite decision-makers in powerful corporations? If so, what is lost in the form of critical scrutiny?

We return to the three sets of questions in the concluding chapter, illustrating that all concepts discussed in the following chapters have certain positive attributes, and also fall short in one or more of these areas. Environmental sociologists, like adherents to other disciplines, often strive for a unifying theory to encapsulate the field (e.g. Kasper 2016), a goal that is rarely met, but one that nonetheless sparks heated internal divisions. The identification of a single, unifying and comprehensive concept, however, is an unrealizable goal. Conceptual plurality is not only necessary, it is a measure of the richness and vitality of any field of inquiry, and provides opportunities for reflexivity, and this plurality invites both specialization and synthesis (Lidskog and Waterton 2016b). A plurality of core concepts—concepts that are well recognized in environmental scholarship—will provide fertile ground and a useful tool-box for more fruitful, flexible and reflexive theorizing of our multifaceted socio-material world.

Conceptual Traps in the Study of Environment-Society Relations

In addition to discussing the role and importance of core concepts, we find it necessary to emphasize some conceptual traps that scholars ought to have in mind when theorizing and reflecting on environment-society

relations. Acknowledging that it is neither necessary nor possible to elaborate on all kinds of common conceptual traps, such as circularity, atomism or conceptual fuzziness, we encouraged all contributors to this volume to focus explicitly on those that affect how core concepts have evolved historically in sociology and environmental sciences and that appear problematic for the critical-constructive study of society-environment relations today. Indeed, scholars and other actors need to be reflectively aware of how our framings of reality facilitate or inhibit social change, including how basic ontological and epistemological assumptions may affect these framings and create vulnerabilities to certain conceptual traps, or combinations thereof.

Reductionism

Concepts are needed that can capture environment-society relations, and in addition enable comprehension of our interconnected world, both spatially (Van Koppen and Bush, this volume) and temporally (Lockie and Wong, this volume). White et al. (2016, p. 17) understand social reductionism 'as the tendency to underplay the importance of material forces on society, the assumption that 'culture,' 'history,' 'society,' or 'discourse' trumps everything.' Since Emile Durkheim formulated his methodological rules for sociology more than 100 years ago, sociologists everywhere have been taught to think that society exists (*sui generis*) and to explain social facts by other social facts. The avoidance of consideration for the interaction or entanglement of society with biophysical conditions as well as bringing in such conditions in efforts to explain social dimensions has not just been a tendency but an explicit disciplinary strategy. Several chapters in this book express the importance of countering this tendency, and explicitly discuss material dimensions (e.g. Pellizzoni on the 'commons', and Davidson on 'metabolism').

On the other hand, *ecological reductionism* is systemic in the environmental sciences. In many environmental conceptualizations, the ecological domain is treated as something objectively fixed and given, something to which the social domain must be oriented. Perhaps more often the social is treated as a single variable, factor or pillar, or a limited list of ele-

ments, or a black box (cf. Brulle and Dunlap 2015, p. 15). In other words, the social dimension is reduced to (just) one measurable and manageable aspect, such as 'population' (to be controlled), 'population growth' (to be stopped and potentially reversed), 'attitudes' (to be changed), or 'the public' (to be educated). In their discussion about the 'Anthropocene', Lidskog and Waterton (2016b; and this volume) warn that this concept could result in naturalization, and inattentiveness to issues of power, intersectionality, politics, and injustice. Similarly, Rau (in this volume) shows that the concept of sustainability is severely limited in terms of both explanatory power and practical relevance because of its persistent inattention to the socio-material complexities of everyday life and mundane practices.

Dualism vs. Hybrids

Reductionism has affinities with dualist thinking. As noted by White et al. (2016), the irresolvability of many of the debates on society-nature relations can be attributed to their binary underpinnings. Some of the more fundamental are Society vs. Nature, Material vs. Culture, Body vs. Mind, and Human vs. Non-human. Very significant are also distinctions such as 'Malthusian' pessimism vs. 'Promethean' optimism (Dryzek 2012), Growth/Degrowth, and political/geographical divisions, such as North/South, East/West, Developed/Developing, Democratic/Totalitarian just to list a few. White and his colleagues introduce 'hybridity' as a way to overcome dualist and binary thinking, with reference to theorists such as Bruno Latour, Donna Haraway, Ulrich Beck, David Harvey and several others. These theorists highlight a more relational and entangled view of the society-nature relation (and similar distinctions), and today scholars have at their disposal many new and fruitful conceptualizations of the entangled relationships between individuals, organizations and institutions. The concepts of social practices (Huddart Kennedy and Hauslik, this volume; Rau, this volume), and networks (Oosterveer, this volume) appear among the most promising.

However, contemplations of hybridity have themselves been criticized (Dunlap 2015; Murphy 2016). Murphy (2016) argues for the need to

conceptually disentangle what has become empirically entangled. Only in this way we can study the interactions between 'social constructions' and 'nature's construction', he argues, and be in a position to study variations of empirical hybrid manifestations. 'The concept of co-constructed hybrids is an indiscriminate grab-all notion that must not be allowed to degenerate into conflating two referents just because they are found together empirically, thereby obscuring significant differences and relationships. It lacks specificity and raises more questions than it answers' (Murphy 2016, p. 338). White and colleagues also urge scholars to 'relativize' what is 'human' in much hybrid thinking: 'Without the capacity to think through human/non-human points of *continuity and difference*, we have no social science, nor do we have any capacity to respond coherently, ethically and politically to the socio-environmental dilemmas of our time' (2016, p. 35). Environmental social scientists thus face a challenge to bring conceptual order to a messy, entangled and changing empirical reality, which some postmodern social scientists call 'hyper-reality.' Concepts are needed that can sufficiently simplify empirical reality to make it comprehensible, but not to the extent that it becomes reductionist.

Rigid vs. Over-Elastic Views of Society

The theorizing of environment-society relations requires concepts that can take into account (the potential of) agency and social change. In social science, concepts such as 'transition' and 'social movements' engage in crucial questions about opportunities and barriers for change. Chapters in this book engage in concepts such as the environmental state (Mol), green consumption (Huddart Kennedy and Hauslik), experts (Lidskog and Lundqvist) and democracy (Fischer), which all have relevance for change-oriented work. Equally important are theories and concepts that focus on why change might not happen. In these theorizing efforts, however, there is a risk of over-emphasizing the rigidity of social structures, stability, social order, inertia and path-dependencies, while overlooking processes that imagine, conceptualize and facilitate change.

Yet researchers can err too far on the other end of the spectrum as well. As an example, White et al. (2016) criticizes Latour's Actor-Network-Theory for its over-elastic view of society.

'Latour's tendency to view all consolidated social-ecological-technological forms as dissolving into fluid networks or assemblages would seem, as its core, to underestimate *the sticky obduracy of certain key social processes and institutional forms* that have shaped modernity, notably capital and processes of labor, nation-state boundaries and political interests, patriarchy, racism, imperialism, and so on' (White et al. p. 133). This implies a rather shallow view of society that can easily be constructed, and then torn apart and reconstructed in another way. As will be shown throughout this collection, such theories fail to conceptualize rigid structures, deeply embedded relations, and path-dependent historical processes.

Environmental scientists also need to be reminded to avoid adopting an over-elastic view of society, such as those mirrored in calls for *urgent* and *dramatic* societal transformation to save humanity from self-destruction. In these debates about solutions, words such as 'innovations', 'green technology', 'regulations' and 'decision-maker' frequently feature, often in an uncritical way. The use of such concepts will certainly be necessary if aspirations to 'rebuild' and 'transform' societies are to succeed. However, calls for change without due consideration for the more inert aspects of society are likely to remain ineffective or even fuel resistance, regardless of how urgent the transformation is.

Greenwash vs. Hyper-criticism

Does a particular concept evoke problem-solving or problem-maintaining? Murphy (2016) argues that problem-solving conceptualizations are awkward, even dangerous, if problems in reality are escalating. A 'false-positive' impression helps actors legitimize problematic practices. In environmental studies, the word greenwashing is frequently used to critique how concepts such as 'sustainability' and 'responsibility' are used in policy and practice to legitimize questionable practices. However, a 'false-negative' impression may lead to other problems such as resignation and fatalism. The word 'hyper criticism' can be implied for instances when someone criticizes something or someone else for whatever s(he) thinks or does. This is an a priori rejection, akin to social discrimination.

This pendulum between greenwash and hyper-criticism has also been observed in the heated debates that have taken place within environmental sociology between two core bodies of theory: *treadmill of production* (see e.g. Schnaiberg et al. 2002), and *ecological modernization* (see e.g. Mol and Spaargaren 2000). While the former emphasizes the apparent inevitability of environmental destruction caused by capitalism's expansionist tendencies, the latter instead focuses on the creation of an ecological rationality in and through that very capitalist system. The former places blame on a growth coalition including capital, the state and labor; the latter considers how and in which contexts those same institutions can be reformed. These two competing theories and their associated conceptual underpinnings have fueled research that draws markedly different conclusions. A new technology, for example, may be interpreted as a sign of an ecological rationality, or a form of 'greenwashing' that effectively conceals the fact that environmental degradation has simply been relocated to developing countries with cheap labor and poor environmental regulation. We are not suggesting that adherents of either theory *necessarily* espouse 'greenwash' or 'hyper-criticism', but rather that strict adherence to any single set of theoretical premises constitutes a form of conceptual trap, leading to the tendency to favour the selection of research inquiries to support the theory, rather than the other way around.

Grand Theory vs. Narration

Finally, the warnings posed by C. Wright Mills and Robert Merton many decades ago retain their relevance today. As stated by Mills in *The Sociological Imagination*, grand theorizing entails 'a level of thinking so general that its practitioners cannot logically get down to observation' (Mills 2000[1959], p. 33). For the grand theorists, concepts become 'fetishized' argues Mills, and such theories tend to be associated with monocausalism: attributing outcomes to a single cause. Some theories, for example may postulate that social change is driven entirely by capitalism (e.g. Marxism) or division of labor/social differentiation (A. Smith/E. Durkheim), or a process of rationalization (M. Weber). Such tendency usually involves theory-supporting rather than theory-testing. This ten-

dency can still be observed across the environmental sciences, such as the debate between ecological modernization and treadmill of production discussed above. Yet others grapple with the proliferation of overly descriptive empirical studies in environmental social sciences, including both single case qualitative studies, and quantitative analyses of various statistics and survey data, which offer few opportunities for conceptual development.

Finally, 'theories of the middle range' (Merton 1967[1949]) engage a plurality of core theories and concepts. It is this middle way of theorizing that engages what Mills (2000[1959]) calls the 'sociological imagination', which is a quality of mind, expressing the capacity to shift from one perspective to another, to see that things could be different, and views contemporary events as part of history and part of creating history. This middle way also embraces reflexivity, which itself has appeared as a core concept in environmental sociology. The topic of denial, which started our discussion of this introductory chapter, has been conceptualized as a struggle between reflexivity[1] and anti-reflexivity. The risks and the uncertainties of contemporary times and the destabilization of authorities of modern societies could lead to reflexivity—understood as a critical-constructive mind-set—but could very well also lead to the opposite of reflexivity: denialism, fundamentalist ideologies, nationalism, and xenophobia.[2] While acknowledging that reflexivity is not the antidote to every problem (see Boström et al. 2017), it is nevertheless a necessary ingredient for both our sociological imagination and our ability to navigate between the conceptual traps discussed previously.

Introducing the Chapters

Contributors to this volume, all working within the field of environmental social science, provide critical insights into the questions that we have raised in this chapter. Each chapter grapples with problems and assumptions associated with how we think and talk about society-environmental relations, with an eye toward directing these discussions toward constructive responses to environmental problems.

For obvious reasons, it was not possible to cover all concepts that appear in environmental sciences and policy debates. It is our intention to represent a wide variety of core concepts, some with origins in sociology or social sciences more broadly (environmental state and governance, global networks and flows, social practices, expertise, the commons, environmental justice, and environmental democracy), and others that originated in the natural and other sciences but which have been taken up by social scientists (risk, resilience, Anthropocene, metabolism, economic valuation). Finally, there are concepts that originate in policy discourse, but which have gradually entered into scientific discourse: a key example scrutinized in this book is the concept of sustainable development (in its modern incarnation). Concepts dealing with temporal and spatial dimensions often have more heterogeneous origins involving a broad array of disciplines and discourses. Here follows a brief introduction of each.

We find it apt to begin with Anthropocene because this concept has been thrown into the limelight in rather dramatic fashion in the past few years, both within the environmental sciences and outside academia. The Anthropocene embodies a broad recognition that the entire planet is fundamentally shaped by the human species. Environment and society are profoundly intertwined and, combined with concepts such as planetary boundaries and tipping points, it provides the rationale for calls for urgent, radical, and large-scale action. Rolf Lidskog and Claire Waterton reveal the multiple layers of the concept, and discuss both the promises and risks of adopting this concept.

While geology is the starting point for the Anthropocene, biology is the origin of another concept that has been increasingly applied to society-environment interactions, specifically in terms of flows of energy and material substances: *metabolism*. What are the challenges of analyzing social systems (rather than individual bodies) from a metabolic perspective? Debra Davidson discusses these epistemological and other challenges while at the same time showing how the concept has engaged numerous studies historically, and in a contemporary interdisciplinary field. The environmental social sciences contribute with many insights on the role of, for example, urbanization, technologies and capitalism, as well as on what happens when places of extraction are geographically

separated from places of wealth accumulation. Two other originally non-sociological concepts, the traditional concept of risk (assessment) and the more recent concept of resilience are combined in the chapter by Marja Ylönen, in an attempt to facilitate interdisciplinary dialogue in the environmental sciences. How can developments in resilience engineering (with a focus on adaptation, anticipation, socio-technical systems), technical risk assessment (focusing on calculations of probabilities) and social sciences (focus on governance, cultural aspects, risk societies and epistemological questions) enhance fruitful dialogue between these otherwise separated fields?

Among the social sciences, there is a broad and rich discussion of how different processes of globalization trigger the need for new ways of understanding governance, authority, and interconnectedness. Cross-border environmental issues are often of core focus in these debates. Peter Oosterveer elaborates on this topic by moving away from an overly nation-state centered theory of governance. Commodity chains have become increasingly global and complex with significant cross border material and immaterial flows of money, commodities, energy, people, knowledge, values, and information. These flows create considerable governance challenges and give rise to new sources of power. In this chapter, *global environmental networks and flows* is presented as a promising conceptual package to increase our understanding of these dynamics. The problems associated with governing and state authority in an increasingly global and complex world is furthermore grappled with by Arthur P.J. Mol, in a critical review of the concepts *environmental state* and *environmental governance.* A stagnation of the environmental state is discussed as well as the rise of new governance concepts such as *environmental partnerships.* An important topic for the chapter is the positive rhetoric of these new governance arrangements, and the underlying assumptions. Mol concludes with arguments for at least a partial re-centering of the environmental state.

Continuing on the topic of governance, the next chapter focuses on a particular type of governance, *economic valuation,* which has become increasingly dominant in environmental policy and discourse. Steven Yearley critically discusses how questions regarding the social value of the environment have been subjected to 'economisation', whereby elements

of the natural world become redefined as 'negative externalities' or environmental 'goods'. Economic discourse has been put forward as the authoritative and universal means of expressing the value of the environment, illustrated by the growing cache of carbon markets as a primary means to mitigate climate change, and with the popular notion of ecosystem services. The pragmatism of such strategies is clear, and yet the prevalence of market mechanisms conceals a number of glaring limitations, such as the irreversibility and non-tradability of certain ecological processes, and the explicit equity implications of putting a price on ecological wellbeing. Another frequently discussed topic in environmental governance, politics, debate and research, concerns *environmental expertise*. Environmental expertise is essential in all social spheres of environmental planning—market, civil society, and politics—and on all policy levels. Yet, the development and credibility of environmental expertise cannot be taken for granted; indeed, far from it, particularly in the face of broad pluralization and contestation of science. Rolf Lidskog and Göran Sundqvist develop a conceptual understanding of expertise from both an epistemic (having the skills and competence) and social dimension (recognition, support). They show the importance of looking at both dimensions for an understanding of how environmental expertise can be developed, authorized and applied.

Optimistic prescriptions for 'going green' without significant structural changes to our social systems and economies have been a mainstay in political and academic discourses alike. Green consumption as an individual, voluntary choice, rather than shared responsibility of citizens, the state and capital is core in this narrow discourse. Emily Huddart Kennedy and Darcy Hauslik explain in their chapter why the approach and concept of *social practice* offers a much more adequate framework to thinking about responsibility and pathways toward greening of everyday life, because it takes seriously the socio-material structures within which practices unfold, and offers a more embedded view of individual action. The social practice perspective is also used for scrutinizing the concept of *sustainable development.* Henrike Rau offers a nuanced and rigorous critique of the overly technocratic and managerial approaches commonly used in sustainability assessment and planning. She shows how many contemporary sustainable development efforts rest upon a rather uncritical

acceptance of ideas of measurable economic growth, linear social progress and consensus, while neglecting many conflicting and mundane aspects of sustainability. Most prominent forms of sustainability assessment mirror this, in particular through their emphasis on quantification. Responding to these flaws in current SD thinking and practice, Henrike Rau argues for the adoption of a social practice perspective to better understand and account for everyday life experiences and mundane practices, matched by practice-oriented sustainability assessments (PROSA) that provide more accessible and inclusive tools for engaging citizens, communities, scientists and policy-makers.

Inequalities in various facets appear among the core topics that sustainability tools need to grapple with. One of the most central concepts used to explore equity and the differentiations in society that are associated with our relations to the environment is *environmental justice*. As Timmons Roberts, David Pellow and Paul Mohai show, studies using this conceptual framing explain how environmental divisions follow classic cleavages along, for instance, racial, ethnic, class, and gender dimensions. Environmental justice research has a vast, open agenda, the authors argue, with great promise for applications, from the local to the international realms. These intellectual efforts in their turn have re-invigorated theoretical consideration of the concept *environmental democracy*. Frank Fischer explores the theoretical bases and realities of pursuing environmental democracy—from liberal to radical accounts—in the global and local context. Agreement with core principles of environmental democracy, including participation and deliberation, may be easier than their implementation in practice, given the inherently unequal and transboundary distribution of ecological degradation, and the implied requisite for representation of both nonhumans and not-yet-living humans (future generations). Fischer also notes that the tensions between environmentalism and democracy sometimes support calls for forms of eco-authoritarianism that view democracy as the problem rather than the answer when it comes to addressing environmental disruption. In the environmental sciences, one classic such view with authoritarian implications relates to Garret Hardin's notion of 'the tragedy of *the commons*'. Luigi Pellizzoni reviews this and related concepts and discusses how various types of social processes (globalization, new technologies, capitalism,

imperialism) are involved in *commoning*, appropriations, and enclosures. Social relations around access, management, and property are at stake in these processes. And socio-material and immaterial aspects are often intertwined, which is illustrated by examples such as biotechnology patents and sharing economies.

Finally, the book includes two chapters that draw attention to two dimensions critical to our understanding of environment-society relations: *space* and *time*. In both these chapters, several concepts that focus on the spatial and temporal dimensions of society-environment relations are critically scrutinized. Kris van Koppen and Simon Bush focus on *spatial frames* and the quest for *institutional fit* between ecology and society. The concept of institutional fit is critically reviewed, and they offer a multi-dimensional definition by paying attention to biophysical, political, socio-economic and socio-cultural meanings. From their multi-dimensional perspective important implications in activities like attribution of territory, land use planning, nature conservation, and ecosystem management can be critically analyzed. We learn that there is not one universal and objective space, but many spaces, and the same insight applies to the temporal dimension, explored by Stewart Lockie and Catherine Wong. Their chapter too focuses on conflicts between ecosystems and social systems, but now on time. There is always a temporal dimension implicated in processes of socio-ecological change, including notions of urgency, acceleration, disruption, adaptation, planning, the future, and so on. The authors argue that the sociological analyses of time need to offer more than a pure critique of modernity, but must also engage the multiple and often conflicting temporalities implicit in specific environmental governance and knowledge practices. Key arguments are illustrated with reference to climate governance and techniques: forecasting, scenario building, climate modeling, and the conflicting timeframes of markets and political decision-making.

In the concluding chapter, Magnus Boström, Debra Davidson and Stewart Lockie discuss how conceptual reflexivity can be fostered as a way to confront post-truth and rising denialism. They offer critical reflections on the concepts explored in this volume, by returning to the three questions introduced in this chapter: on the concepts' explanatory values, biases and blinders, and action-potential. By drawing on insights from

the book's chapters, the conclusion engages in a discussion of ways to achieve richer conceptualization of society-environment relations as well as more robust and sociologically-informed understandings of society and its many spheres of structure and agency. In closing, the authors apply our sociological imagination to explore what future(s) may lie ahead. The afterword, written by Matthias Gross, provides some thought provoking reflections on risks that befall environmental sociology and other disciplines in the environmental sciences when adherents fail to question mainstream concepts, assumptions, and statements in contemporary green thinking. Rather, we need to reinvent a sociological imagination and for this we need an ironic perspective and a wry smile.

Notes

1. The concept is particularly associated with the theories of risk society and reflexive modernization, developed by Ulrich Beck and Anthony Giddens in the 1980s. It is associated with a rather optimistic account of the propensity of individuals, experts and organizations to, based on the experiences of escalating risks and hazards, reflect on how existing practices reproduce problems, and based on this develop new practices (see Boström et al. 2017 for a review). Even if risks and environmental problems escalate, the theory of reflexive modernization holds that there is an increasing propensity for reflexivity due to historical processes of individualization and the undermining of traditional authorities and structures (e.g. the state, church, science, gender roles).
2. These potential tendencies have been analyzed by a number of scholars including Beck 2009; McCright and Dunlap 2010.

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2

The Anthropocene: A Narrative in the Making

Rolf Lidskog and Claire Waterton

Introduction

Contemporary understandings of global environmental threats include two central aspects: first, threats are held to be anthropogenic in nature, and second, they are thought to be solvable through human action. One of the most powerful concepts launched to capture this duality and call to action is *The Anthropocene*. This concept, which made its international breakthrough in 2000 (Crutzen and Stoermer 2000), conveys the idea that human beings are living in a new geological era; an era created by humankind (Anthropocene) in contrast to earlier eras that were created by the forces of nature (Holocene). But the idea that humans are now making geological footprints is not the only or central meaning of the concept. Tightly connected to this concept is something much bigger and more seri-

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ous: the concern that human activities are now undermining Earth's life support systems (Rockström et al. 2009). According to this view, humankind is now facing its greatest challenge ever, and rapid and extensive societal changes are needed to stop this trend. This is a challenge for society in general but also for science, which has to produce relevant knowledge to facilitate and guide this social change (Zalasiewicz et al. 2010).

This narrative of Anthropocene has been institutionalised within the scientific community in a short period of time: networks have been formed, conferences organized, websites established, research programmes have been elaborated and journals have been launched with the aim of studying all aspects that pertain to the Anthropocene. There is a large internal scientific debate about the conceptual meaning of the Anthropocene. One issue is whether one can really speak of a new geological epoch, and if so, when (and through which methods) one can date its beginning (Edgeworth et al. 2015; Zalasiewicz et al. 2014). Another, as we have indicated, is whether, and to what extent, the fundamental functions of the Earth system have been transgressed (Rockström et al. 2009; Steffen et al. 2015b). A third issue concerns the need to develop new technologies and smart organization in order to build a way out of the impending environmental crises (Buck 2015). A fourth issue concerns the need to change the institutions and the fundamental values that support unlimited growth without considering its environmental 'bads' (Steffen et al. 2011b), as well as the need to build global governance systems that can handle global environmental problems (Biermann 2014). These are only a few of the issues raised but they show that the concept has inspired a proliferation of different questions and debates.

The concept has also spread largely outside its original scientific context and it has quickly gained a more affective tone in the last few years. For example, museums and galleries have elaborated exhibitions on what it means to live in the Anthropocene (Robin 2014). The most well-known is probably *Welcome to the Anthropocene. The Earth in Our Hands,* which during 2014–2016 was organised by the Deutsches Museum in Munich, Germany. The exhibition was extremely successful, with an average of 8500 visitors per month. In its closing month, more than 22,000 people visited it. The exhibition consisted mainly of a display of "anthropocentric objects" such as the steam engine, gasoline pump, telegraph, hairdryer, television, weather satellite and personal computer. Six thematic

areas—urbanisation, mobility, humans and machines, nature, food, and evolution—formed the structure of the exhibition, with 30 monitors showing bespoke films. Visitors were met by a number of statements such as "Anthropocene has arrived", "You are Anthropocene", "We are all responsible" and "Together we can change a lot". But the visitors were also asked very open questions such as: "How does the world community govern itself?", "Who is responsible for a product?" and "Is Anthropocene just?" The exhibition offered a complex picture of human development, showing that agriculture, trade, transport, industry and urbanisation have created enormous social and material progress, but that they also, in time, made strong footprints upon the earth, often of a seemingly irreversible kind. The exhibition does not associate Anthropocene with resignation and fatalism; rather with hope and possibilities. As the subtitle of the exhibition says: "The Earth in Our Hands". The destructive power of humans is only part of the story, humans are also creative and intellectual and have the power to deliberately shape the world. As the curator of the exhibition states: "the Anthropocene has made us all into global actors" (Möllers 2014: 122). In a sense, it echoes earlier messages—about global environmental threats, limits to growth, and the possibility of alternatives development pathways—but, as we will explore in the next section, it involves new thinking making it a strong and dynamic narrative.

It is interesting to note that this usage and spread of the concept Anthropocene was not originally intended. It was spontaneously invented in a scientific conference by the Nobel laureate Paul Crutzen, and he and colleagues have since asked themselves why it is that this concept has not been discarded as a footnote in the history of geological ideas (Zalasiewicz et al. 2010: 2228).[1] Crutzen originally considered the Anthropocene to be too complex a concept to take off in the public domain: "I really thought it would be something only for the scientific community because it's such a vast and complex topic. But obviously I underestimated the power of this idea. The Anthropocene idea is now animating many people in many places in new ways and I am very happy about that" (Crutzen quoted in Schwägerl 2014: 35).

Since its first mention in a scientific conference, the concept has made a remarkable journey, and is now widely adopted not only by many environmental scientists but also by cultural institutions, environmental

movements and governmental bodies. Its meaning is dynamic and changing—from defining a geological epoch, to conceptualising the current environmental predicament of humankind, to becoming also a workable buzzword aiming to direct attention, mobilise people and facilitate environmental action. At the same time, it is a subject of lively debate, not least due to the sense that the concept not only diagnoses the environmental state of the world, but also traces social causes and suggests possible future ways forward. The concept has inspired natural scientists, especially Earth scientists, to urge for a rapid and effective response in order to change current trends. Straying away from their disciplinary comfort zone, they have begun to ask probing questions about social agency, human responsibility and global governance. This extension of natural science into the social domain has, at times, evoked strong criticism from the social sciences, claiming that to a large extent the discussions are based on a simplified view of society that ignores much established knowledge in the social sciences (Baskin 2015, Cook and Balayannis 2015, Lövbrand et al. 2015, Malm and Hornborg 2014). However, the social sciences have not only criticised the concept, but also started to make use of it and offer substantial contributions as to its meaning, as we suggest below.

The Anthropocene is a hybrid concept that includes both nature and society, in which a geological epoch, an environmental state and human activities are intertwined. The concept may, if oriented towards sociological interpretation, provide the opportunity for social experimentation and disciplinary development in the social sciences—especially regarding areas of research where demarcations between nature and society (or between the natural sciences and social sciences) are blurred. In this sense the Anthropocene may be an important vehicle for increasing boundary-crossing between disciplines and for centring debates more firmly on social-environmental dynamics, a focus which environmental sociology has long supported (Catton and Dunlap 1980; Hannigan 2014; ISSC 2013; Lockie et al. 2014)

The Anthropocene has developed, however, to become more than a concept, bringing together a set of compelling narratives which involve large amounts of information, specific meanings and normative stances about what to do. It connects different actors' perspectives and practices,

and may also construct a shared understanding of a problem. We therefore consider in this chapter the implications for environmental social scientists. Relating to concepts that have originally developed in the natural sciences requires careful handling. When social science makes use of concepts originally elaborated by natural science, it experiences opportunities but also risks. The possibility for developing environmental social sciences in new directions lie in waiting, but these may not all be constructive directions in which to go. This chapter is therefore devoted to a critical and constructive discussion of the current meanings of the concept of the Anthropocene. It considers how this concept—understood as a set of narratives—can nourish environmental sociology and other environmental social sciences but also how we might think about developing the concept in line with social scientific thinking. In the next section we will therefore say something more about narratives and their functions. We follow this with a third section of the chapter where we explore the current focus and debate of the Anthropocene narrative. We find that the narrative has gradually included social scientific knowledges but that its adoption also involves risks; it steers our way of thinking in particular directions and may restrict sociological elaborations and explorations. In particular, we discuss how the narrative understands social change and human agency as well as how it oscillates between a reductionist and relational ontology. In the fourth section, we conclude by stressing the importance of looking at the constitutive aspects of our concepts, and at the implications a concept has for our political discourse, social arrangements and desirable futures.

Narratives: Ordering Social Reality

There is a close relation between our (changing) world and the language we constantly develop to explore it. Changes in the environment create a need to adapt language through giving old concepts new meanings and through inventing new concepts that better grasp changing circumstances, emerging questions and new findings. Conceptual developments, in turn, pave the way for modifying and changing environments. Thus, the socio-material dimension of conceptual change and the conceptual

dimension of socio-material change are two sides of the same coin. At the same time, the relation between concept and reality is not a closed but a contingent one. Some concepts are more apt than others for understanding a socio-environmental problem, and the fact that a concept becomes widespread and well-used does not necessarily imply that it is well-founded and formulated. A reason for this is that concepts have an important cultural and communicative function. They create space for intra- and interdisciplinary discussions between scientists and sometimes also transdisciplinary discussions between scientists and non-scientists.

Being interested in the relation between social and environmental dynamics means that environmental social sciences are constantly faced with the challenge of relating to concepts that are already part of environmental science discourse. To critically reflect on the relevance of certain concepts is not only important for an analysis to be conducted, but for the overall identity of a discipline. The reason for this is that concepts and their usage affect disciplinary self-understanding. For environmental sociology and some other environmental social sciences, a particular challenge has always been to avoid naturalisation, whereby certain conceptual meanings and social phenomena are taken for granted. An example has been the uncritical adoption of models of climate change dominated by natural science perspectives: when this happens, the environmental problem can become detached from its social context, reducing its meanings and acts of meaning-making (Dunlap and Brulle 2015; Hulme 2014).

Broad communicative concepts aimed at persuading a wide target group are often made up of, or constituted by, narratives. Narratives do not only condense large amounts of information and assumptions, they also assign meanings to them in order to direct attention and motivate action. In this respect, narratives can be seen as a kind of story-telling by communities or networks that attempt to deal with specific problems collectively (cf. Jasanoff 2012; Lidskog et al. 2010; Turner 2001). These stories are often based on symbols and analogies, for example in the form of significant and formative events and indexes and graphs that summarise complex and broad processes of change. A narrative gives a historical account of the problem, its causes and consequences, which motivates, guides and legitimizes decisions and actions. A narrative often also highlights the urgency of strong mobilisation and action but

rarely opens up examination of the assumptions on which suggested causal relationships and proposed solutions are based. If successfully distributed, a narrative is naturalised—in that it becomes taken for granted. The history of environmental narratives is full of a-sociological ways of thinking about social change, including managerial and technocratic perspectives about how to govern people and organisations. But from a sociological perspective, a crucial question is therefore how social change, human agency and political responsibility are understood in and through particular narratives. And so exploring the Anthropocene narrative means that, as well as its explicit content, assumptions underpinning the narrative, and their wider implications, require discussion and scrutiny.

Anthropocene: A Dynamic Narrative

Layers of Anthropocene

The narrative of the Anthropocene is dynamic and changing: new layers of meaning are constantly added to old ones. As we mentioned in the introduction, the original geological meaning has been complemented by a biospheric meaning and gradually also social and cultural meanings. The narrative of the Anthropocene has not only transgressed disciplinary boundaries but has also affected boundaries between science and society. Museums, galleries and artists, for example, are now taking part in its ongoing evolution. Thus, the narrative is still very much a concept in the making, involving a plurality of meanings, tensions and debates. We have chosen the metaphor of "layers" to give justice to the dynamic character and multiple meanings of this narrative. We hope thereby to avoid building a straw man—or a definition that is too static—which could easily be criticised from a social scientific perspective. We have read the first three volumes (2014–2016) of *Anthropocene Review* (in total 60 articles) and also a number of well-referred articles published by other journals. Based on this literature, we find at least four layers; a geological layer, a biosphere layer, a socio-economic layer and an ethical layer (for a more detailed discussion of the layers, see Lidskog and Waterton 2016).

A geological layer: The original idea of the Anthropocene is that there now is a geological period characterised by a human-modified earth stratum (the Anthropocene) distinct from the non-human deposits that have characterised earlier strata (the Holocene). This proposal has led to a vibrant and dynamic discussion amongst geologists concerning how to periodise history in a geologically sound way (Steffen et al. 2011; Zalasiewics et al. 2014). A central question discussed here is whether Anthropocene really should be defined as a new *geological* epoch (i.e. as a distinct stratal unit). Even if this has yet to be confirmed by the International Geological Congress, many geologists are busy hypothesising when this epoch began. Such preoccupations also inspire more fundamental critical questions: for example, as to whether a stratal approach in itself implies an overly linear and deterministic view of history.

An earth system layer: If the Anthropocene had only concerned the existence or not of a new geological layer, the narrative would probably have had a very restricted spread outside the scientific community of geology. The reason, on the other hand, why this original geological concept has made such an imprint in environmental discourse is that it signifies a much bigger and more severe change, concerning the sheer extent of human impacts on earth. Whereas humanity has always influenced its environment, what is taking place now is that human action has not only modified ecosystems but has started to transform them. It is no longer only restricted areas that are thought to be affected, but the entire planetary biosphere and its fundamental ecosystem functioning. The narrative of the Anthropocene connects in this respect to recent developments in the earth system sciences. Just as the Anthropocene is a fundamentally global concept, relating to the geological strata of the entire planet, earth system scientists have begun to explore and measure physical earth system dynamics on a planetary scale (Hamilton and Grinevald 2015, Williams et al. 2015) suggesting that humans are living beyond the regenerative capacities of various vital earth systems. Earth systems scientists see the designation of the Anthropocene as a warning and a call to action. They suggest that a trajectory away from the Holocene could lead to a very different state of the Earth, one that is likely to be much less hospitable to the development of human societies (Steffen et al. 2015a). Their concern is to steer development so as avoid driving the Earth system away from a

Holocene-like condition. They have consequently defined a number of physical earth system boundaries with quantified limits/thresholds to help delineate what they believe to be "a safe operating space for humanity" (Rockström et al. 2009; Steffen et al. 2011b; Steffen et al. 2015b). Earth scientists see an urgent need for a new paradigm which integrates human development within such boundaries (Steffen et al. 2015a).[2]

A socioeconomic layer: The discussion around planetary boundaries has inspired earth system scientists to make some strong pleas for social change and for political action. However, the discussion here involves rather little about drivers behind the development towards (or even crossing) these boundaries. On the other hand, there is discussion about relating earth system trends with socioeconomic factors. The most well-known example here probably concerns discussion around the metaphor of *the great acceleration.* This refers to the marked increase in human activities since 1950, resulting in a drastic increase in pollution (Hibbard et al. 2007; Steffen et al. 2007). Metaphorically speaking, this is seen as humanity "switching gears", speeding up the tempo of "growth", identifiable through rising trends of resource extraction and environmental emissions (Steffen et al. 2011a). A number of graphs—including the famous *hockey stick* graphic –summarise this dramatic increase in human activity and environmental destruction. Such sharply ascending figures have become iconic symbols of the Anthropocene (Fig. 2.1).

Originally, what we are calling the socioeconomic layer within the Anthropocene narrative did not primarily focus on any particular drivers or social causes, only summarily referring to abstract and uniform global forces such as "humanity", "values", "growth", "consumption" and "trade" (see eg. Barnosky et al. 2014; Hibbard et al. 2007; Steffen et al. 2011b). This tendency has evoked strong criticism from social scientists, who have forcefully stressed that such language misleadingly portrays uniform planetary trends, thus obscuring a socially stratified and polarised world. To speak about global drivers, in terms of an abstract and homogenised humanity or to refer to a global social process without any actors behind these processes, conceals issues of power, agency and responsibility. However, social scientists have gradually started to contribute to the narrative, stressing that socio-economic patterns need to be complemented by socio-structural perspectives, which stress the social causes—structures

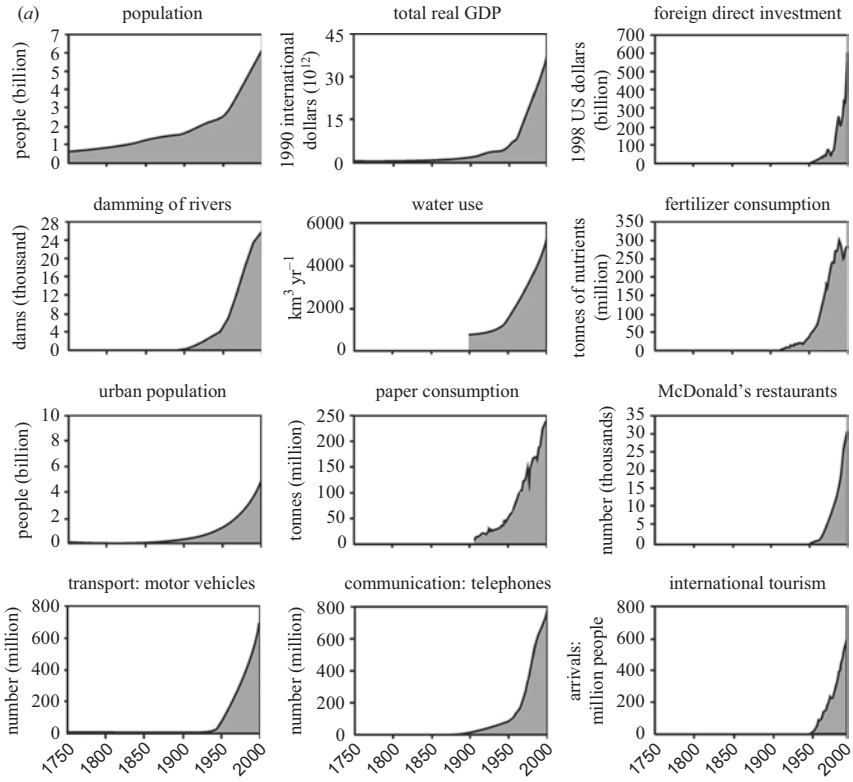

Fig. 2.1a The increasing rates of change in human activity since the beginning of the Industrial Revolution (source: Steffen et al 2011a: 851)

and actors—behind current development (Malm and Hornborg 2014; Neimanis et al. 2015). Furthermore, various contributions from social sciences and humanities also stress the importance of making theoretical and conceptual space for alternative developments and socionatural orderings (Buck 2015; Castree 2014; Gibson-Graham 2011). Here, cultural activities, such as exhibitions, galleries and cultural performances, are vitally important, not least to raise broad questions about, and inspire alternative imaginaries of, possible and desirable futures (see eg. Möllers 2014, Robin et al. 2014).

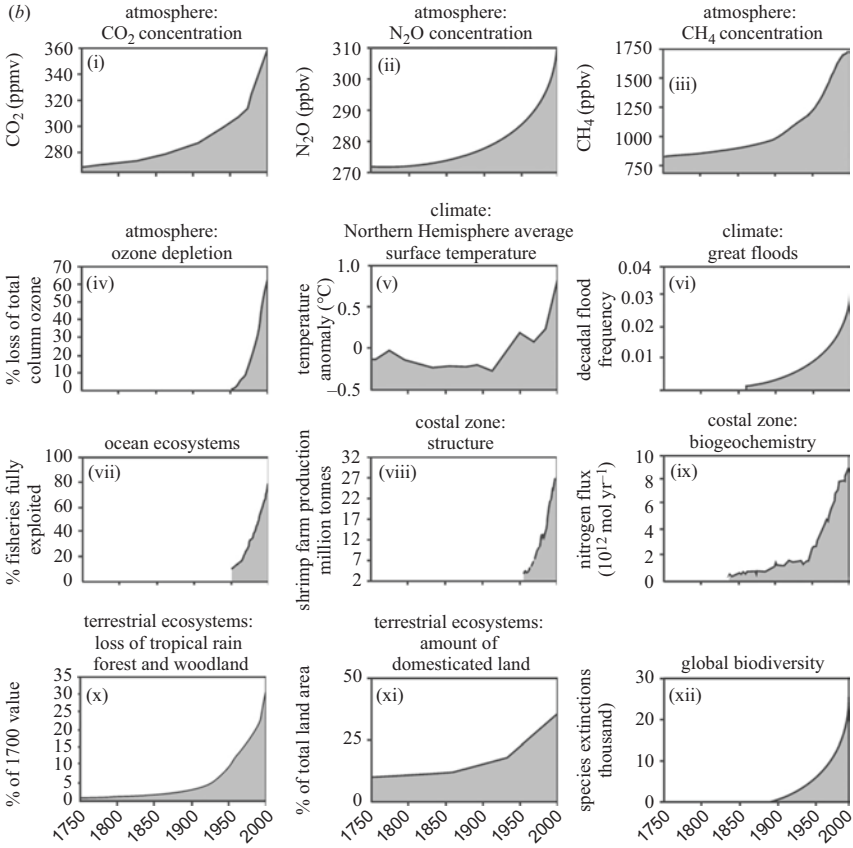

Fig. 2.1b Global scale changes in the Earth system as a result of the dramatic increase in human activity (source: Steffen et al 2011a: 852)

An ethical layer: Since its origins, the Anthropocene narrative has included ethical strands, or at least a normative imperative concerning the need to change the current trajectory that humanity, *writ large*, appears to be embarked upon. Based on an ethical imperative, the proposed directions for action are diverging. Some stress the importance of regulating technological innovations that lead to new products and new needs, whereas others attach their hope to the rapid uptake of new technological innovation—from smart cities and green technologies (Buck

2015) to a belief in large-scale technical solutions such as geoengineering (Lynas 2011).

Within this ethical layer, there has been a growing concern about the way that humanity and humans are enacted as a single, monolithic whole, through, for example, the Great Acceleration and the hockey stick metaphor. Instead, we are ethically obliged to understand and interpret the subject of the narrative—the Anthropos—as spatially and socially differentiated. We are charged to recall that it is only a small fraction of humanity that have caused the current environmental situation, and that the consequences of this—environmental bads—are unevenly distributed in time (across future generations) as well as space (in terms of regions, class and gender) (Biermann 2014; Lövbrand et al. 2015; Malm and Hornborg 2014, Schmidt et al. 2016; see also Roberts et al. this volume on the environmental justice concept). Along these lines some initiatives have been taken to make the great variation in human induced environmental impact more visible. An example of this is that the update of the great acceleration graphs (Steffen et al. 2015a) now includes differentiated graphs for OECD and non-OECD countries respectively. Obviously, this is only a first small step towards an understanding of society as stratified, implying in turn the need for a differentiated understanding of the causes of environmental damage. But what it hints at is the idea that humanity is stratified—economically, socially and politically—and that this has fundamental moral implications whereby issues of interregional and intergenerational justice come to the fore. Ethical thinkers thus claim that new kinds of concern arise when the story of "one earth" is related to narratives of "many worlds" (Chakrabarty 2014, Onuf 2013, Schmidt et al. 2016). The Anthropocene narrative itself therefore does not only convey an ethical situation: it *engenders* many ethical quandaries. These demand consideration when actors and institutions speak of making decisions and strategies to combat ongoing environmental destruction. When such decisions and strategies involve the development and implementation of unproven technologies (such as geoengineering) the stakes are even more intense, pulling ethics deeper into the domains of democracy, technology, innovation and governance.

Providing Space and Directing Attention

As discussed above, the Anthropocene narrative has gradually included social scientific knowledge. It does now include discussion of social causes as well as the social and ethical implications of the Anthropocene. It provides space for social experimentation and disciplinary development that may challenge earlier demarcations between nature and society as well as between the natural and social sciences. But concepts are not neutral tools, used to uncover reality and open it up for research. They are performative: they do something with the world they research and also with the discipline that makes use of them. We suggest it is therefore important to reflect on the implications of concepts and their usages, including those that seem to be promising and generative.

Being a dynamic narrative in the making, with different layers of meaning, involving various temporal and spatial scales, means that it is hard with any certainty to discuss the implications of the Anthropocene concept. With this uncertainty acknowledged, we will discuss some possible implications, seeing the Anthropocene narrative as providing both opportunities and risks for our general understanding of current environmental challenges and thereby also for environmental social science. Within the scope of this paper, we will restrict ourselves to a discussion of two important aspects: the narrative's view of social change and its relational ontology.

The need for *social change* is central to the Anthropocene narrative. Within it there is a strong plea for humanity to change track. But if the power to shape the planet has moved from nature to humans, as the narrative suggests, it is important to consider how agency is acquired and exerted. Hitherto surprisingly little attention has been devoted to this issue. Many contributions—not least from non-social scientists—seem to have an implicitly Socratic view of social change, implying that knowledge about the current situation is enough to mobilise such change. But, as described above, there are new layers of meaning added to the narrative, which introduce the need to think deeper about how society works. These contributions need to be supported and further developed in order to avoid fostering a naïve view of social change and human agency.

Human beings and social organisations are always and everywhere embedded in socio-cultural contexts. They appropriate the world—

interpret, understand and act upon it—on the basis of their embedding. To understand why certain activities and practices have been developed and how they are changeable, we therefore need to understand how the world looks from within, from the actors' contexts and positions. If not, there is a risk that the Anthropocene narrative will embrace a simplified and over-rationalistic view of agency that does not take into account how different contexts enable and constrain social actions. Another trend we can see is the increase in contributions to scientific journals that emphasise the social and cultural aspects of the changing planetary environment (see eg. Lövbrand et al. 2015; Neimanis et al. 2015, Palsson et al. 2013). Still, this aspect remains underdeveloped and much of the scientific discussion refers to humanity in universal and abstract terms (e.g. Rockström et al. 2009; Steffen et al. 2011a, 2015b). There is therefore still a need to acknowledge more fully the cultural diversity of the Anthropos. The Anthropocene exhibition described in our introduction is an example of the open and creative ways in which cultural institutions invite the public and researchers to explore, in specific and culturally differentiated terms, what it means to live in the Anthropocene (Möllers et al. 2014, Robin et al. 2014).

Human beings are not only embedded culturally, but also structurally. Agency is unequally distributed, that is, different actors have different degrees of power and differentiated opportunities for action. They also contribute to different degrees to today's environmental problems, implying that they also have different responsibilities in terms of solving such problems. As discussed above, the Anthropocene narrative has started to include a differentiated understanding of society but this is rarely given concrete meaning (Steffen et al. 2011a, 2015b). *It is above all a common planet and not a divided world that the narrative is centred around.* There is thus a risk that the narrative may have a de-politicising function by highlighting the urgent need for action and change, but failing to fully identify the different patterns and pathways that have led to the Anthropocene, the institutional changes needed, or the different amounts of power and agency that actors have. We refer again to the "great acceleration" which consists of a number of graphs showing a dramatic increase in human activities with substantial environmental emissions as consequences. Several articles mention various reasons for this development—such as technological innovation (the steam engine), and the commercialisation

of fossil energy and economic globalization (Rockström et al. 2009; Steffen et al. 2011b)—but no deeper analysis is made about this development. To merely suggest that humans consume too much, renders invisible the interests and responsibilities of many actors, not least those of nation-states and transnational corporations. The current situation is caused by a specific kind of (capitalist) society that is organized in certain ways that demand a constant increase in consumption (Bauman 2007; Shove and Spurling 2013). Some researchers have therefore suggested that the term Anthropocene should be replaced with that of Capitalocene because that makes it visible that it is not an abstract humanity but a specific form of social structure centred on capital accumulation that is the source of today's global environmental threats (Malm and Hornborg 2014; Johnson et al. 2014; Lorimer 2014; Moore 2016).

In some regards, the way that environmental challenges are evoked by the concept of the Anthropocene resonates with current social theorizing in environmental sociology. The idea of the Anthropocene is based upon a *relational ontology* where society and nature are co-constructed. Not only environmental problems and issues, therefore, but the environment *itself* is co-constituted by ecological and social processes (Dearing et al. 2015; Knight 2015; Zalasiwicz et al. 2010). This means also that it is virtually impossible to establish simple, linear links between cause and effect (Oldfield et al. 2014). Anthropocene stories continuously highlight the multiple, interdependent relations within nature, within different forms of materiality, within technologies and within social systems, but they also stress the interconnections between these domains. Thus, the narrative deepens our sense of the interrelatedness between nature and society (Palsson et al. 2013). This interrelatedness is what environmental sociology and many other environmental sciences actively seek. An important goal of environmental sociology, for example, is to collaborate with other disciplines in a way that treats social dynamics as seriously as environmental dynamics and in a way that brings interconnections and interdependencies to the fore (Lidskog et al. 2015).

In other ways, the narrative contains a number of contributions that have a *reductionist,* or at least *a hierarchical, ontology.* This is visible in the discussion on planetary boundaries, and its safe operating space for humanity. These boundaries are absolute, they are portrayed as "intrinsic

features of the Earth system … exist[ing] independent of human actions or desires" (Steffen et al. 2011a: 860). To suggest that there are biophysical limits in nature may be comparable to suggesting that there are social limits in society (resulting, for example, in social disintegration if they are crossed). However, a one-sided emphasis on biophysical limits implies a standpoint close to a "biology first model" (which environmental social sciences frequently face) whereby the natural sciences define the environmental problems and then the social sciences are invited to help to develop knowledge and find solutions to these pre-defined problems. Using our metaphor of layers, there is a risk that these layers are seen as hierarchically ordered, where the geological and Earth sciences layers are seen as more fundamental than the socioeconomic and ethical ones. To state that "the evidence so far suggests that, as long as the thresholds are not crossed, humanity has the freedom to pursue long-term social and economic development" (Rockström et al. 2009: 475) opens up for discussion whether other core values such as democracy, human rights and justice can be trumped by reference to planetary boundaries. One response to this has been to complement the biophysical boundaries with socio-political ones, claiming that the goal should be "a safe *and just* operating space for humanity" (Dearing et al. 2015, Hajer et al. 2015, Raworth 2012). Thereby, the current challenge is broadened, suggesting that society currently transgresses both sets of boundaries, facing both human inequality and deprivation *and* environmental degradation. This scenario demands far greater efficiency in resource use for meeting human needs, *and* far greater equity in its global distribution. It also implies that, instead of seeing the layers as unidirectional and hierarchically ordered, they should be viewed as fundamentally interrelated and mutually influencing each other; they are folding, mixing, imploding into each other.

Conclusion: Conceptual Innovations and Implications

As discussed here, the Anthropocene narrative makes a diagnosis of the current situation, describes its causes, and stresses that urgent action is needed in order to avoid a global environmental catastrophe. It also

points out that a universal we—"humanity"—can do something about it, because "we are the first generation with widespread knowledge of how our activities influence the Earth system, and thus the first generation with the power and responsibility to change our relationship with the planet" (Steffen et al. 2011b: 756). The Anthropocene narrative invites other disciplines to contribute to this task; to develop knowledge about the need and ways to change current human activities that threaten the life-support system of earth. This means that environmental social sciences have an important role to play, and a cross-disciplinary interchange has already been initiated (Lidskog and Waterton 2016; Lövbrand et al. 2015; Palsson et al. 2013).

Like many other modern conditions, however, the Anthropocene is not directly perceptible due to its very complex character. As for many other environmental challenges, the term itself is a shortcut for a very complex problem, observable only through scientific models and measures. The Anthropocene narrative folds in, as part of its great effort to make environmental changes visible and understandable, cultural limits and biases of understanding. These do not only involve beliefs about how the world is, but also how it ought to be. Thereby the Anthropocene narrative does not only shape understanding of the current situation but also that of possible and preferable futures. But its view of the world, and the limitations that are inevitably built into that, are not always made explicit or discussed.

What we suggest here is that narratives are not simply the discursive counterpoint to material reality, they are also a constitutive part of this world, deriving from particular situated perspectives (Law 2004, Jasanoff 2012). They *do* something with the world they explore—they are navigational (directing our attention), normative (shaping our priorities) and performative (reproducing and maintaining specific kinds of representation and action). Concepts embody tacit assumptions about the constitution of both the social and natural world, including ideas about their separateness and/or their entanglement. Any concept that grasps the history of the environment includes not only a story about how and why we have arrived at the current environmental situation, but also some thoughts on how to get out of it. Explicitly or implicitly, such a concept conveys understanding of environmental challenges, human life, societal

organisation and social change. A narrative naturalises a set of ideas, makes them appear as visible common sense, simultaneously rendering other ideas invisible. Narratives guide our attention and reveal as well as conceal activities, actors and responsibilities. Therefore, an important set of questions to be raised include: what is the narrative of the Anthropocene doing to us? What implications does the adoption of the Anthropocene have for our political discourse, social arrangements and desirable futures? And also, what are we doing with the concept of the Anthropocene?

In asking such questions, we acknowledge that environmental social sciences should not be working in isolation. Being interested in both society and nature means that we have to be interested in the knowledge production of both the social *and* natural sciences, and thereby also the concepts that are used within these fields. Our biggest challenge, therefore is to open up the concept of the Anthropocene with others. As social scientists, we are trained to identify and challenge the assumptions, the blind-spots and the naturalisations that support even the most compelling of narratives. We need to work out how, situated within this dramatic story, as we are, we can make those observations and pose those challenges in ways that help develop both the social and the natural sophistication of the concept.

Notes

1. The origin of the Anthropocene concept can be traced back to a conference organised the year 2000 by the International Geosphere-Biosphere Programme (IGBP). The session organizer focussed his contribution on the Holocene (the current geological epoch that began 12,000 years ago). Finally one of the participants, the chemist and Nobel laureate Paul Crutzen lost his patience, effectively announcing the end of this current era. As he later recalled: 'I said we no longer live in the Holocene, but in the Anthropocene. After that, it suddenly went very quiet in the hall. In the coffee break the only issue discussed was the Anthropocene' (Crutzen 2013, our translation).
2. *Planetary boundaries* was originally presented in an article in in *Nature* (Rockström et al. 2009), where nine planetary boundaries were presented

with nine thresholds for various biophysical subsystems and processes. The article was updated, developed and revised in an article in *Science* 2015 (Steffen et al. 2015b).

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3

Metabolism

Debra J. Davidson

Introduction

The concept of metabolism is straightforward in theory, and extraordinarily complex in its implications, particularly as we extend its application from its biological origins to social systems. Environmental social scientists have found merit in doing so nonetheless, and while a number of epistemological challenges have emerged as a result, in this chapter I argue that metabolism has been, and can continue to serve as, a central concept for understanding the co-relations between social and ecosystems.

Metabolism refers to the physical and chemical processes that occur within a living organism in order to transform ingested substances into the forms of energy, protein and nutrients needed by that organism to survive. We usually hear about metabolism in reference to food consumption—"with her high metabolism, Jane the Athlete is always

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hungry"; or "Bill needs to watch his weight, he has such a low metabolism." John B. Foster (1999) has done a fair bit of research on the history of the term, which was introduced by German physiologists in the early 1800s, to refer to material exchanges within the body, and later by Liebig, with whose help it quickly emerged as a key concept in agricultural chemistry modelled along societal needs (Bing 1971; Caneva 1993; both cited in Foster 1999).

From this conceptual basis, we know that either the lack of required inputs, or the breakdown within the organism of the ability to convert those inputs and excrete wastes, will compromise the survival of that organism. It stands to reason, furthermore, that larger and more complex organisms must be able to metabolize a larger volume of energy and nutrient inputs. Not all treatments in the social sciences provide a comprehensive metabolic account of social systems, considering the epistemological challenges associated with identifying all the "energy and nutrient" analogies relevant to the maintenance of those systems, as well as the numerous pathways through which energy and nutrients are metabolized for use. Incompleteness does not translate into invalidity, however, but it does implore us to consider the wide body of scholars who have taken up the challenge of analyzing social systems from a metabolic perspective, rather than relying on a single line of inquiry. In what follows, I provide a brief review of a number of these lines of inquiry, which I label the Grand Theorists; the Empiricists; the Ecological Economists; the Metabolic Rifters; and finish with recent work that illustrates the analytical richness of current research.

The Grand Theorists

Numerous scholars throughout history have made theoretical contributions to contemporary understandings of social metabolism. In this section, I only highlight a few key figures, beginning with Howard T. Odum and his brother Eugene (Odum 1969, 1995, 2007; Odum and Odum 2001). The Odum brothers were among the more notable scholars to apply the metabolism concept to biological levels above the organism, and eventually to societies as well. Although both were trained in the

natural sciences, their interest in and sensitivity to social systems was no doubt imparted by their father, noted sociologist Howard W. Odum. The Odums' key contribution to this line of scholarship was the development of a common metric—"emergy"—intended to capture the multitude of inputs that are ultimately required to provide societies with access to energy (and thus the generation of wealth). This work was a precursor to more recent Energy Return on Investment (EROI) analyses, which calculate the amount of energy lost during its transformation into forms of energy that people can use to heat homes, power factories, and fuel cars, ships and planes. *Emergy* analyses, in contrast to EROI, represent bold efforts to capture more than strictly energy (calories, kilowatts) inputs. Rather, emergy (originally termed embodied energy) is intended to capture all forms of energy, from sunlight to labour, engaged in those metabolic processes that convert energy resources into forms we can use.

In the social sciences, researchers working with Robert E. Park at the University of Chicago in the 1920s developed a conceptual framework to describe cities as ecological systems, ultimately founding the field of human ecology. This work is captured in *The City,* published in 1925, which also served as a foundational text in urban sociology. Known since as the Chicago School, Park and his colleagues applied ecological concepts such as succession, competition, symbiosis and niche to urban studies. These developments led to a conceptual framework that depicted cities in terms of concentric, spatial zones, each identified by a unique set of ecological characteristics. While conceptualization of metabolism was not explicit in this work, their ecological depiction of cities certainly resonates with the concept, particularly with attention to material stocks and flows. Interestingly, this body of scholarship emerged from what was the very first university department of sociology in the U.S. (Gross 2004), illustrating a strong influence of ecology on the early development of sociology as a discipline.

Leslie White (1900–1975), an American anthropologist who was also quite influential in sociology, stands out as a grand theorist of note. White did not use the term metabolism explicitly either, but nonetheless shared the Odums' fixation on the energy requirements of social systems (White 1943) and the means by which energy access—and in particular, the technologies employed to do so—determined the rate and form of eco-

nomic development, and ultimately culture. In other words, while White did not draw attention to material flows (including waste) as such, his work had much to say about the metabolic pathways at our disposal to convert raw energy resources into forms that could be used. White was heavily influenced by Darwin, Spencer, and other evolutionists, and characterized human evolution as a sequence of stages defined by different forms of energy capture, from reliance on human labour, to the domestication of animals, and so on. He depicted the fifth and most advanced stage to be the harnessing of nuclear energy—a determination that perhaps reflects his lack of attention to material (waste) flows. In all stages, White perceived cultural and economic development (P) to be determined by the product of the total amount of energy consumed (E) and the efficiency with which it is utilized (T), represented in a simple formula: P=ET. Thus, social progress depends upon the emergence of technological improvements in society's ability to harness energy, or improve the efficiency of its use. For White (1943: 356), the ultimate cause of the spectacular changes in the Western world over the Twentieth Century "is found in the discovery and utilization of the means by which heat energy can be made to do man's work for him."

Work by the Odums, Leslie White, and the Chicago School human ecologists have all been criticized over the years. The emergy concept has been criticized for being rooted in an out-dated depiction of nature-in-balance (Heneghan 2012). Despite the ecological ambitions of Park and his colleagues, some have noted that their framework nonetheless reduces the natural environment to its spatial structure, while simultaneously oversimplifies social organization to accommodate an ecological paradigm (e.g. Fischer-Kowalski and Weisz 2016). White has received particularly strong criticism within the social sciences for his determinism, providing what many would consider a reductionist account of history. In other words, each has ultimately simplified aspects of either social or ecological systems in an effort to develop a unified theory of social-ecological relations. And each expressed some degree of functionalism or determinism in their propositions, neither of which provides a tenable understanding of complex systems. In more recent years, researchers contemplating the prospects for transformative energy shifts have offered a more sympathetic view of this historical work. Love and Isenhour (2016),

for example, acknowledge the groundwork set by White to articulate the energetic and technological bases of social systems, a necessary prerequisite for facilitating a low-carbon transition.

The Empiricists

Metabolism has also been taken up by several ambitious modellers with greater interest in operationalization than theorization, primarily working in the industrial ecology school. These researchers have attempted to provide a robust empirical account of the material stocks and flows operating within a given system. They tend to do so, as did members of the Chicago School, by focusing on cities.

While relying on recent advances in computing technologies that allow for complex modeling, these researchers are nonetheless working from within a body of scholarship that dates back to the Nineteenth Century. Although the term metabolism was not consistently used in earlier accounts, attention to the accumulation of waste in cities was an enduring concern, which evolved into the subfield of urban ecology in the 1960s, with Lewis Mumford (1961) as one of its main contributors. It wasn't until 1965 that an engineer, Abel Wolman, introduced the term "urban metabolism." He defined the city's metabolic needs as "all the materials and commodities needed to sustain the city's inhabitants at home, at work and at play" (Wolman 1965: 179). A key contribution of this scholarship that was seemingly lost on White and others was attention to the pollution that results from urbanization. According to Barles' (2010) summary of urban metabolism studies, researchers in this field have focused on "upstream and downstream consequences in terms of the removal of resources and the discharge of waste materials (to the atmosphere, water and soils), with multiple impacts on ecosystems and on the biosphere."

Industrial ecology's applications of metabolism look quite a bit different today than their predecessors (e.g. Pincetl et al. 2012; Zhang 2013). Zhang (2013) offers a review of the current state of the field, and its strong reliance on modelling, as he captures in the following figure (Fig. 3.1).

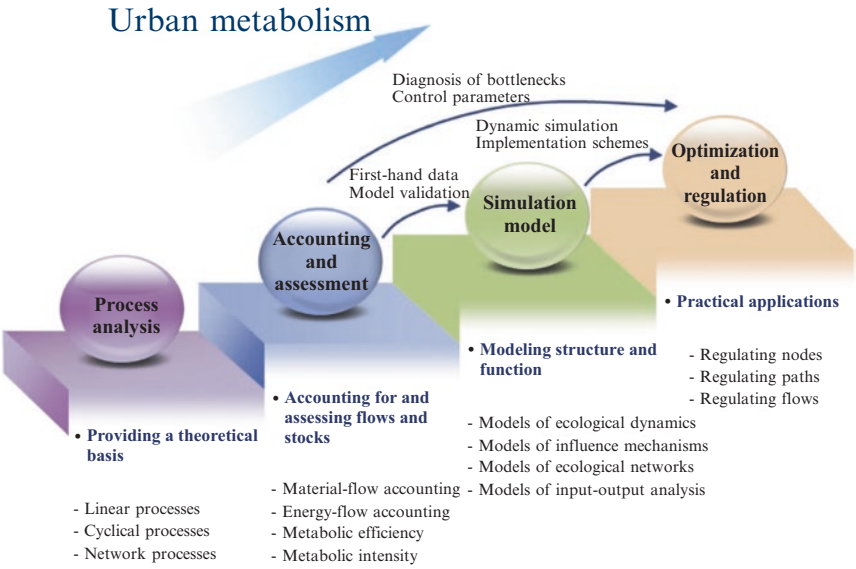

Fig. 3.1 Research methodologies used to study urban metabolic systems. Source: Zhang (2013: 464)

These applications allow for evaluation of the energy and, increasingly, the carbon intensity of different economic sectors within a city (e.g. Zhang et al. 2014). A group of researchers at the Autonomous University of Spain in Barcelona have developed a particularly sophisticated model to encompass both social and ecological systems, which they refer to as the Multi-scale Integrated Analysis of Societal and Ecosystem Metabolism (MuSIASEM) (Giampetro et al. 2009; Ramos-Martín et al. 2007, 2009). This model allows for forecasting of the energy metabolism of alternative future development pathways, including the social implications of resource scarcity and historic trends in energy intensity.

There is a notable lack of attention to political and economic power in this work, or human agency, for that matter. With the lion's share of attention accorded to materials and technologies, humans are all but absent in many accounts. The implicit understanding expressed by many in this field that any given social unit (a city) has the potential to achieve metabolic balance (the MuSIASEM school excepted) is also highly

problematic. All social (sub)systems form parts of a complex and interdependent global whole, and the very complexity of that global whole implies that each individual node (city, economic sector) is not self-sustaining but rather interdependent on other nodes.

Regardless of these shortfalls, the efforts on the part of urban metabolism researchers to capture empirically the energy and material stocks and flows of cities has enabled tremendous advances in urban modelling with important applications for sustainability planning, and improved our empirical awareness of the sheer volume of materials and wastes that are associated with an urbanized society.

The Ecological Economists

Our third line of research narrows in on the elephant in the room of the previous two schools of thought: capitalism. While ecological economics represents a broader body of work than that represented here, the scholars to which I wish to draw attention are associated with this discipline. However, they differ from many of their colleagues who support the prospects of a "steady-state economy," achieved through the internalisation of the costs of environmental impacts. Orthodox economics refers to environmental impacts as "externalities," or in other words unintended side effects of economic transactions that simply need to be corrected for in the marketplace. To the contrary, the researchers I focus on here have offered powerful metabolic treatments of contemporary global capitalism that call the very notion of a steady-state economy into question, including in particular Nicholas Georgescu-Roegen, Joan Martinez-Alier, and Stephen Bunker.

The work of these seminal figures was preceded by Karl Polanyi. For Polanyi (1944), capitalism destroys the very socio-ecological resources it requires in the process of creating market value (See O'Hara 2009). For Polanyi, the prospects for internalizing these costs are nil, because this destruction is in fact the very basis of profit (Kapp 1976: 95). Polanyi essentially describes the metabolism of a capitalist economy, and highlights the fact that destruction of the very metabolic requirements of that system will lead to its demise.

Polanyi referred to energy and resources largely in the abstract. Georgescu-Roegen on the other hand, a student of Joseph Schumpeter and trained in both mathematics and economics, rendered the role of energy in particular far more concrete. He highlighted the energy dependence of capitalist economic growth, and importantly, the inevitable and irreversible degradation of energy and material resources in the process:

> As imperfect beings, we must live in a physical world, subject to the steady degradation of energy and materials known as entropy. All our efforts, personal and economic, continually oppose this force. Global production and trade systems do so on a massive scale, harnessing enormous amounts of energy to build the physical economy. (Georgescu-Roegen 1971, cited in Sager 2016: 31)

While Georgescu-Roegen's work focused on entropy rather than metabolism (as illustrated in the title of his key work: *The Entropy Law and the Economic Process,* 1971), an implicit metabolic framework is clearly present, in his close attention to the material and energy flows required to support an economic system. As summarized by O'Hara (2009, see also Hornborg 2006), Georgescu-Roegen taught us that an economic system based on accumulation and growth cannot be sustained because resources will be used up, and waste accumulated, and, similar to Polanyi, these processes are inherent features of capitalism. Consequently, a purely circular or enclosed system is impossible because entropy leakage gathers momentum along with growth and consumption.

Martinez-Alier, with training in agricultural economics, elaborated upon this framework. Similar to Georgescu-Roegen, Martinez-Alier refers to the energy and resources that make social reproduction possible. But he adds to Georgescu-Roegen's work, by drawing explicitly on Marx's depiction of social metabolism, which shines the spotlight on one key metabolic process: labour. As well, in comparison to Georgescu-Roegen, Martinez-Alier (2002) paid more attention to the ecological disruptions introduced by the outputs of economic processes, and the distribution of those disruptions. Martinez-Alier highlighted the fact that the need to secure energy and material requirements for capitalist growth compels the continuous geographic expansion of extraction activities, as exploited

reserves become exhausted. The resulting separation of places of extraction from places of wealth accumulation amounts to an *unequal ecological exchange*, a process that has since been taken up by others (see, e.g. Rice 2007). Martinez-Alier thus turned his attention to the ensuing ecological distribution conflicts that lead to social mobilization, or to use his term, the "environmentalism of the poor." Interestingly, Martinez-Alier was not the first to identify processes of unequal ecological exchange. Although Howard T. Odum's work in this area is less well-recognized, he was aware that the emergy exchange ratio is heavily biased against poor, rural countries. According to Odum (1996), when an environmental product is sold from a rural state to a more developed economy, there is a large net emergy benefit to the latter. Underdeveloped countries are thereby systematically robbed of wealth.

Stephen Bunker was a sociologist, but his work is well-situated along the lines of inquiry opened by Georgescu-Roegen. Bunker draws on the metabolic studies provided by ecological economists, but pays particular attention to unequal ecological exchange. In his seminal work, *Underdeveloping the Amazon* (1985), he uses a detailed case study of that region's development history, focusing his analysis on modes of extraction. Based on this study, he argued that the energy embodied in the raw materials extracted from peripheral regions, and the ecological waste left in its wake, served to enhance the wealth accumulation of those countries in which the materials were eventually processed, further adding value, and ultimately consumed. Meanwhile, the very bases upon which future development might ensue in the periphery is undermined. According to Chase-Dunn (1998), Bunker's analysis was key to developing a theory of unequal ecological exchange, highlighting the fact that the unequal exchange of labour is accompanied by the unequal exchange of matter and energy. The greater Amazon region continues to serve as global supplier of timber, fossil fuels and minerals, and faces extensive environmental costs as a result (see e.g. Boyd 2013).

Bunker and other contributors have identified critical linkages between rural impoverishment and natural resource development, offering one of the most important contributions from the environmental social sciences to our understanding of social-ecological relations. As it pertains to the conceptual development of metabolism, these scholars described the

spatial segregation of metabolic processes through the globalization of raw materials industries, with social systems in the core boosting their metabolism by drawing energy and nutrient requirements away from social systems in the periphery, and leaving the waste produced by those processes for those peripheral social systems to deal with. As Sager (2016: 32) argues, "the materialist approach taken here ties hegemonic power to biophysical resources—particularly energy—and their control, while viewing energy markets as supporting complexes of economic, political, and strategic institutions."

Ecological economics offers a strong critique of the neoclassical paradigm that remains a mainstay of the discipline of economics. Ecological economists have received a fair share of criticism from those mainstream economists in exchange, who point to numerous examples of increases in resource productivity and technological innovations to dispute the ecological economists' dire warnings of system collapse. This debate is situated within ideological parameters that characterize much of the environmental sciences, but we can also point to a limitation of this line of research: by zeroing in on material processes, the role of human agency once again gets the short shrift. There are exceptions, particularly Martinez-Alier's attention to resistance in rural communities. Greater attention to resistance and its many forms, as well as the decision makers and decision-making structures that govern our exploitation of resources, the pathways through which those resources are rendered into consumable products, and attention to waste could offer a much richer and institutionally-contingent account of our social-ecological relations.

Metabolic Rifters

Some of the most prominent and active areas of recent scholarship on metabolism have been motivated by John Bellamy Foster's foundational paper (1999) on Metabolic Rift. I discuss this article and subsequent work by Foster and others further below, but before doing so, it is important to note an earlier critical Marxist account of social-ecological relations from within Foster's own subdiscipline of environmental sociology.

Nearly two decades before the publication of Foster's paper on Metabolic Rift, Allan Schnaiberg's (1980) work on the Treadmill of Production was first published which, although lacking explicit adoption of the concept of metabolism, nonetheless offered very complementary insights on the tendency for capitalism to cause environmental degradation and resource exhaustion, due to the inherent imperative to generate surplus value.

Foster begins with an explication of Marx's use of the concept of *Stoffwechsel,* or social-ecological metabolism. Central to Marx's treatment were the social mechanisms involved in the metabolization of nature, namely labour (and by extension technology). Quoting Marx: "Labour is, first of all, a process between man and nature, a process by which man, through his own actions, mediates, regulates and controls the metabolism between himself and nature. He confronts the materials of nature as a force of nature. He sets in motion the natural forces which belong to his own body, his arms, legs, head and hands, in order to appropriate the materials of nature in a form adapted to his own needs." (Marx 1976: 283, cited in Foster 1999). Equal conceptual attention was given to both the natural limits to human access to the energy and materials in ecosystems, and the ability of humans to transform those materials into resources they can use, in their bodies, and in their factories. In this way, both natural laws and social institutions were seen to govern society's relationship with nature.

Writing at a time of rapid urbanization in Europe, Marx depicted the "urbanization of the countryside" (Marx 1973: 479, cited in Foster 1999), describing the mass migration of people from rural, agrarian regions to cities—a movement that was elemental to capitalism—as a central process of disruption in social-ecological metabolism. Referring to Liebig's theory of biochemical reproductive cycles, he argued that this urbanization "prevents the return to the soil of its constituent elements consumed by man in the form of food and clothing; hence it hinders the operation of the eternal natural condition for the lasting fertility of the soil" (Burkett and Foster 2006). Marx describes pre-industrial, agrarian communities as systems in which metabolism was maintained: people consumed agricultural products, and the wastes they produced were returned to the soil, thus maintaining soil fertility. When those people

migrated to the city, agricultural products were transported to the city for consumption, but the waste produced remained in the city rather than being returned to the land. This removal of human wastes led to the industrial production and application of fertilizers, which only exacerbated the disruption, further depleting the soil of its organic fertility.

Marx focused on agriculture in particular. However, Foster and colleagues take up the concept of Metabolic Rift as a general statement on capitalism, describing the inherent capitalist imperative to maximize the production of surplus value while minimizing production times. Doing so forces the incorporation of ever increasing volumes of materials and energy into production faster than the metabolic processes that allow for the availability of such resources. This causes ruptures in ecological cycles, such as those that provide for the replenishment of soil fertility (Burkett and Foster 2006; Foster 2000). Clark and York (2005) make effective use of the Metabolic Rift lens to explain the historic accumulation of CO_2 in the atmosphere, viewing the rupture of the carbon cycle as analogous to the rupture in soil fertility.

Research on the Metabolic Rift has much to offer to metabolism analysis. The theoretical developments offered by this body of scholarship provide a compelling challenge to the notion of an ecologically-benign capitalism: without the exploitation of nature and labour there would be no surplus value, ergo no capitalism. Yet maintaining the metabolic well-being of human labourers and ecosystems would require returning all such surplus to those entities. Among the bodies of scholarship included for review in this chapter, the Metabolic Rift school is perhaps the one that has given the concept of metabolism closest scrutiny, and has gone the farthest in its application to integrated social-ecological systems, drawing direct relationships from the biological metabolism of workers and families to the metabolism of entire economic systems.

Critiques of Metabolic Rift nonetheless abound, with some offering useful correctives to earlier formulations, and others challenging some of the more fundamental tenets of the framework. As these critiques provide valuable contributions to our broader collective efforts to advance the concept of metabolism, I elaborate on them at some length, lumping them into three camps, below.

1. We Are More Than Just Capitalists and Labourers

A number of scholars, many but not all working from a feminist studies lens, have made what I consider to be two related and very powerful critiques of Metabolic Rift theory. One, there is an entire sphere of human labour that occurs behind the curtains of capitalism—a realm that is absolutely germane to social-ecological metabolic relations—that has been completely overlooked. Second, in the words of Salleh (2010: 207) Metabolic Rift scholarship "risks reifying systemic processes by ignoring significant cultural differences and the thoroughly sex-gendered character of capitalist productivism." This work provides close scrutiny of agency in a pluralistic rather than deterministic manner; it raises the relevance of other major social categories (gender, ethnicity) that drive social processes aside from and yet intersecting with class; and draws awareness to important sources of resistance.

Salleh (2010: 207) points out the fact that "women have been accorded the meta-industrial labor of mediating the humanity–nature inter-face." Spheres of marginalized labour and value, such as Indigenous work, subsistence farming, and social reproduction are outside of the realm of capitalist production and yet nonetheless central to the reproduction of social systems, and should necessarily be incorporated into any comprehensive account of social metabolism. These workers provide metabolic value, argues Salleh, by engaging in regenerative rather than extractive practices, thereby supporting ecological integrity and social metabolism. The engagement of these workers is not merely behind the curtains of capital, however; it represents a potentially formidable source of resistance, as attested by the food sovereignty movement unfolding in opposition to the deepening ecological crises confronting agriculture today (Wittman 2009). Sbicca (2014) similarly sees potential in the urban analogue to the agrarian food sovereignty movement, with increasing mobilization of city dwellers to the conventional agri-food system, including labor investments in urban agriculture.

In short, there remains an extensive social sphere, including labour activities, that lays outside of yet co-exists with the capitalist system, that constitutes an important domain of metabolic relations of some

consequence, and represents a source of resistance both socially and materially to the capitalist-driven Metabolic Rift (Cielo et al. 2016; Fischer-Kowalski 2011).

2. Agrarian Dreams, Agrarian Nightmares

The second major line of critique comes from researchers in agricultural studies. These researchers challenge several of the claims regarding agriculture that serve as key premises of the original Metabolic Rift analysis. This includes in particular the juxtaposition drawn by Foster and others between Rift-inducing capitalist agriculture, and the presumably ecologically benign pre-industrial agriculture. Schneider and McMichael (2010), for example, argue that the Metabolic Rift concept is essentially a poor representation of historical agricultural practices. The concept is constrained at the outset by Marx's own rather simplistic understandings of soil and agriculture. Most crucially, the Metabolic Rift concept has been premised on a shift in the supply of a single source of soil nutrients ("humanure"). Critics point out, however, that the role of human waste in soil fertility is of questionable historical importance in agriculture. Furthermore, *all* agriculture depletes soil nutrients:

> As soon as a seed is planted, it begins using soil nutrients for growth and development. When grains (grass seeds) are harvested, the soil nutrients contained within them are lost from the system. Some may be recycled if the manure of the humans or livestock who ate the grains returns to the soil, but the majority are metabolised for the growth and development of the consumer. (Schneider and McMichael 2010: 469)

Like Schneider and McMichael, Rudy (2001) points to clear historical examples that refute the deterministic, monocausality implied in Metabolic Rift Theory. He points, for example to the English enclosure movement, associated with a massive increase in rural livestock—and therefore the production of livestock feces—raising the probability that the *concentration* of rural wastes from livestock may have been at least as consequential as the separation of rural from urban wastes.

This line of critique does not invalidate the Metabolic Rift theory en toto, but it does make one important point: not all socio-ecological processes can be reduced to a single mechanism. The presumption embodied in Metabolic Rift theory, furthermore, that a benign socio-ecological system can emerge under alternative economic systems that allow for the "rational" or "sustainable" management of ecological relations denies the ecological realities of irreversibility and non-renewability, and illustrates a general lack of concrete attention to ecology, and natural processes. As noted by Schneider and McMichael (2010: 479), it "privileges the capital/labour relation over the 'metabolic exchange with nature.'"

3. Epistemological Weaknesses

Other scholars have narrowed their gaze on certain epistemological aspects of Metabolic Rift Theory. Both Rudy (2001) and Moore (2011), for example, have critiqued Foster's implicit realism. For Rudy, Foster's bold claims—adopted from Marx—of the universal applicability of his materialist dialectics to all phenomena completely glosses over the means by which social processes are qualitatively differentiable along historic, spatial, gender, and cultural lines. Moore (2011) takes his critique one step further, and argues that the Metabolic Rift conceptual framework is essentially Cartesian, relying on static and binary conceptions of society and nature. Ironically, according to Moore, the treatment of nature and society embraced by Foster and others—as "actor and acted-upon, foot and footprint"—is a central pillar of the very neo-classical thought Foster seeks to challenge. For Moore (2011: 1), "capitalism does not act upon nature so much as develop through nature–society relations."

These epistemological weaknesses transpire in an overly superficial depiction of social metabolism. The very term metabolism implies interdependence, rather than separability; a continuous historical coevolution, rather than stasis (Haberl et al. 2016). It also imposes upon the researcher the requirement to focus explicitly on metabolic processes or flows themselves, in addition to the materials and actors engaged in a given metabolic system. Moore counters Foster's Cartesian portrayal of capitalism and nature as independent entities with an historically-grounded

dialectical framework that, in contrast, brings metabolic processes to the fore. Moore does so first and foremost by pointing out that the necessary reproduction of labour power has compelled an endless pursuit of cheap food and energy. What Moore describes here is effectively the metabolic requirements of the social system through which commodities must necessarily be produced; a failure to meet these metabolic requirements would amount to a failure of capitalism. Secondly, Moore argues that Foster fails to consider the very real potential for capitalist growth to be compromised by resource depletion and/or ecological collapse. Every historic moment of capitalist expansion, according to Moore, has been at its core an attempt to overcome a decline in the ability to maintain metabolic processes.

Recent Treatments of Metabolism Open Several Black Boxes

Over the past decade, research on social metabolism has flourished, in ways that have enriched our grasp of metabolic processes and the means by which they define social-ecological relations. I highlight just a few lines of inquiry here.

First, some recent contributions direct our gaze to elements of metabolic processes that were not the focus of earlier works. For example, Marriot and Minio-Paluello (2014) focus on natural gas distribution, in other words the mechanisms that allow for the flow of materials and energy. Distribution networks are a critical component in the metabolism of any system, yet attention to those networks by metabolism scholars is scant. This research highlights the extent to which those networks are devised and managed by political interests in ways that inevitably have social and ecological consequences. In their case study of natural gas transport to Europe, Marriot and Minio-Paluello (2014: 93) note:

> these resources do not flow of their own accord. This is not a rain catchment area in which mountain streams head downhill, joining tributaries and rivers to provide water to the city in the valley. Gas is lighter than crude, but it still requires pressure to force it down a pipeline, while political

> and financial forces determine the route along which it is transported. This mass relocation of great volumes of fossil fuels requires constant coordination of logistical and financial resources. The term 'energy corridor', used in policy documents and speeches, disguises the physical spatiality of the carbonized socio-technical systems that underlies energy mobilities and distracts from their role as pieces of one-way infrastructure that enable a long-term and locked-in resource grab of fuel from the Global South into the European gas grid.

In a similar vein, my work to develop the concept of the Effort Factor (Davidson, forthcoming; Davidson et al. 2014; Davidson and Andrews 2013) brings those metabolic exchange processes, and their inevitably historical character, to the fore. The Effort Factor refers to the amount of effort, broadly defined, required to convert raw materials (minerals, trees, fossil fuels, soil) into the stuff that people use. In other words, the Effort Factor describes the metabolic processes in which we engage continuously to feed our families, societies, and economies. This effort describes an evolutionary process, defined by changes over time in the human and technological capacities utilized, and the changing quality of the raw materials themselves. More to the point, the quality of raw materials tends to decline over time, inevitably in the case of non-renewable materials like minerals and fossil fuels; historically in the case of renewables like soil, fish and forests. Unless our human and technological capacities can expand apace to accommodate this decline in quality with increases in efficiency, a decline in the quality of raw materials requires a requisite increase in the effort required to convert those materials into things people consume. This increase in effort in turn tends to accelerate ecological impact.

Research has indicated an increase in fishing effort associated with declining catch, for example, or an increase in the application of agricultural chemicals (a form of effort) associated with declining harvest (e.g. Davidson et al. 2014). But it is perhaps most vividly observed in the increased effort, and ecological impact, associated with the extraction of oil, the quality of which has been in steady decline over the past century, such that much of what remains is in deep undersea deposits, or locked in solid substrates like bitumen and shale. This declining quality has

compelled reliance on more extreme and costly methods of extraction, including deep-sea drilling, hydraulic fracturing, and oilsands mining. As a result, no manner of technological, market or social "fix" will alter the fact that the costs of extraction increase as the quality of a raw material decreases. This relationship between effort and ecological degradation is a casual mechanism defined in part by the biophysical properties of the materials themselves, and by the social relations that characterize labour and technology.

The work done at the Institute of Social Ecology in Vienna has also vastly enriched the field, both theoretically and empirically. In a recent collection of research produced by Vienna School scholars, Marina Fischer Kowalski and Helga Weisz (2016) identify several distinguishing features of the School. Key among them is the treatment of interactions across social and ecosystems as co-evolutionary: the ability to provide work, energy and material flows for social systems require continuous social re-organization and new interventions in ecosystems (Moore makes a similar point, above). Fischer-Kowalski has also instilled among the School's members the need to pay heightened attention to the role of culture and communication in these inter-relations, important drivers of change that have been overlooked in most other metabolism analyses.

Karl Bruckmeier's treatment, captured in a recent book, *Social-Ecological Transformation* (2016), is also worthy of note, and aligns well with the Vienna School. Importantly, Brukmeier implores researchers to move beyond the metaphorical application of concepts like metabolism, toward their crystallization into theoretical and explanatory concepts. In order to do so, Bruckmeier joins Fischer-Kowalski and her colleagues' call for interdisciplinarity, noting that no single discipline or paradigm can provide for a comprehensive account of social-ecological relations. He calls for placing societies and economies in the foreground of our conceptual framework, but in a system-specific rather than generalized manner, with close attention to the cultural-symbolic realm (education, socialization) in shaping social-ecological interactions. Brukmeier then includes a number of case studies in which he critiques several forms of management and governance from the lens of social-ecological theory. As with Fischer-Kowalski and colleagues, Brukmeier's work marks an important shift beyond description of social-ecological relations, and toward critical

engagement of social metabolism theory to develop better ways of addressing disruptions in social-ecological systems.

Discussion

All too often social scientists take up ecological concepts in slippery ways, the original meanings and merits of the terms lost in the wash. Metabolism refers to the processes engaged in by a living organism in order to acquire resources and expel waste as needed to survive and reproduce. Individual organisms require continuous intake of energy and nutrients from the environment for maintaining and healing its physical wellbeing, they must prevent the ingestion of pollutants from that environment, and expel wastes into that environment, albeit not at a rate that compromises the ability of that environment to continue to provide energy and nutrients. Either the breakdown of metabolic function within the organism, the decline in availability of energy and nutrients in the environment, or the introduction of toxins into that environment—including by the organism itself—would compromise that organism's survival prospects.

Rarely have social scientists taken up the concept with this comprehensive framework in mind. The record of research highlighted in this chapter notes a number of important developments, but also some persistent challenges, particularly the ability to account for agency, and the ability to give equal weight to both social and natural processes. This is to some extent understandable: while the adoption of the concept of metabolism in its original formulation to entire socio-ecological systems is incredibly attractive as a metaphor, its transformation into a theoretically-grounded concept applicable to social-ecological systems is embroiled with some fundamental challenges.

For one thing, while metabolism describes the functioning of an individual organism, socio-ecological systems are made up of any number of independent and yet inter-related organisms. Metabolism work is incomplete without consideration of the multiple organisms (people) operating within socio-ecological systems, both as metabolic units themselves, as agents who consciously and unconsciously respond to metabolic processes operating at the system-level, and the inequities among them in

their ability to see to their personal metabolic needs and influence system-level metabolic processes.

The boundary between this organism and its "environment" is also rather arbitrary. Where does the "environment" serving Los Angeles end and that serving San Francisco begin? Where do the resource, ecological, communication and other interconnections between them stop? (They don't.) This may lead to the logical extension that the only meaningful socio-ecological "organism" is the global one, and yet restricting our analytical lens to the global sphere would be wholly detrimental to our efforts to advance metabolic analysis of socio-ecological systems. These systems are multi-scalar: within that global system are several systems operating at lower scales that must be accounted for.

For scholars to understand the disruptive tendencies in socio-ecological systems, the complexities associated with their varying manifestations, and contribute to addressing those disruptions, we must take the concept of metabolism seriously, and take a close look at the ecological and biophysical properties that are brought to bear. As stated by Hannah Wittman (2009), the concept of socio-ecological metabolism allows us to recognise nature's ability to strike back.

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4

Risk and Resilience

Marja Ylönen

Introduction

The concepts of risk and resilience are ubiquitous in the environmental sciences. Both concepts have spread broadly to different disciplines and research domains. Because of this "travelling" through different domains, both concepts have attained multiple and ambiguous meanings. The primary objective of this chapter is to chart recent developments of these two concepts in non-sociological fields, with a particular focus on the domain of technical risk assessment and resilience engineering. Whether and how the new developments of these concepts open for cross-fertilization between these disciplines and environmental social sciences are examined. Another objective is to examine how the environmental social sciences have enriched the understanding of risk and resilience. Technical risk analysis and social risk analysis often remain separate even though scholars from different disciplines have acknowledged the need to

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examine risks from multiple perspectives to gain better insights into them (Aven and Renn 2010; Löfstedt and Boholm 2009; Reith 2009; Hollnagel 2006; Stoop 2011).

Technical risk assessment refers to technical calculations that show the probability of the occurrence of an event and the severity of its impacts on humans and the environment. In contrast, a social science understanding of risk refers to social, cultural, and cognitive aspects that make people fear some risks over others (Slovic et al. 1980; Douglas 1992). A social science approach can also refer to how the development of science and technology, as well as profound structural changes in society, contribute to the emergence of new risks (Beck 1992). In risk assessment and management, endeavors to integrate technical and social aspects of risk may face practical problems, and these problems are partly linked to different ontological understandings of the term. Nevertheless, in order to foster and maintain a fruitful dialogue between the fields of technical risk assessment and social risk analysis, some basic understanding of what is going on in each other's field is required.

The concept of resilience refers to the ability of a system or an organization to maintain and regain a dynamically stable state and to continue operations after some errors and accidents (Weick and Sutcliffe 2007). The concept has been developed in ecology and engineering sciences, but the environmental social sciences have provided a versatile field in which the concept of resilience has been further elaborated. Climate change, disaster studies, and land use planning are areas where this concept has been exploited. Disaster studies, for instance, have enriched the understanding of resilience by showing the multilayered nature of resilience. Natural disasters have revealed differences in the ability of communities and individuals to respond to unexpected events and to recover from them. Furthermore, the environmental social sciences have enriched the understanding of resilience by providing a range of empirical studies that have opened up the relationship between psychological, social, cultural, structural, and agency-related aspects. I will return to these topics in the chapter.

This chapter argues that there are good reasons to combine the two concepts in analyses of the environment and society interplay. However, the relationship between the concepts is ambiguous. The resilience

concept has been introduced as an answer to complex emergent risks, which are difficult to foresee and to which traditional means of risk analysis cannot respond (Dekker 2011). This view regards resilience as independent of the risk concept and as a response to unknown threats. However, it has been argued that, in order to understand the resilience of individuals or communities, one has to understand their vulnerabilities (Birkland and Waterman 2009), and this would require risk analysis (Aven 2017; Linkov et al. 2014). Therefore, it makes sense to make risk analysis part of a resilience approach. Thus, I have adopted the stance that risk and resilience are complementary concepts and that, nowadays, it is impossible to deal with risks without reference to resilience and vice versa. Such an understanding, however, requires insights from different disciplines, including the environmental social sciences, regarding each of these concepts.

The rest of the chapter is organized as follows. First, second section deals with the concept of risk and introduces some recent developments in the field of risk analysis. The next section defines the concept of resilience, examines some connotations of the concept, and illuminates the relation between the concepts of risk and resilience. The fourth section deals with the contribution of the environmental social sciences and disaster studies to resilience. The final section concludes the main findings and develops the argument that an analysis concerning the interplay of environment and society would benefit from exploiting both risk and resilience concepts.

Risks

Risk is an old concept, and there is no consensus about its origin. Often it is referred to as hazards and dangers. It has been suggested that the term risk entered into the English vocabulary from Portuguese or Spanish and it referred to sailing into uncharted waters (Giddens 1999, 21–22). It has also been argued that the word risk originates from the early Italian verb *risicare*, "to dare." Sailors are said to have deployed the word to warn about rocks at sea. (Bernstein 1996) Several other origins of the concept of risk have also been suggested (Althaus 2005).

The term risk has become one of the key concepts in the social sciences and other disciplines from the 1980s on (Beck 1986; Reith 2009). The concepts of safety and security have also gained prominent space on the international level, including the EU level, and on national and company levels due to the uncertainties that globalization, climate change, the development of technologies and different hazards have posed to societies. What makes risk relevant as a concept? One answer is that safety in high-risk industries, such as in the nuclear industry and the oil and gas industry, is increasingly becoming maintained and improved by risk-informed regulation and approaches (Baldwin et al. 2012). The risk and safety nexus enhanced by notions of resilience and robustness has become popular vocabulary in current discussions about safety-critical organizations and society facing uncertainties (e.g. Hollnagel 2006; Hollnagel et al. 2011).

Technical and social understandings of risks have often been seen as contradictory. The dominant, technical understanding of risk refers to risks as something quantifiable, such as the probability of an undesirable event (Hansson 2009). Ulrich Beck, the developer of the Risk Society thesis (1992), has criticized the technical account of risk as inadequate for capturing the social or societal dimensions that play crucial parts in the production of risks. For Beck, the governance of risks through developing new concepts and strengthening the reflexive capacity of experts and decision-makers is important. Similarly, creating responsibilities for the decisions made, which leads to emerging risks, and the sharing of negative consequences of risks become crucial in the risk society phase of modernization development (Beck 1992).

According to Beck (1992), Western societies have gone through transformations from preindustrial to industrial and further to a risk society phase. Each phase is characterized by different types of and responses to risks. In preindustrial society, typical risks were pandemics and natural hazards, which were not seen as possible to govern. In the industrial phase, typical risks were related to smoking, industrial accidents, and pollution. Risks were socially unevenly distributed in a population, such as when the poorest people lived closest to polluted areas. Environmental justice scholars, among others, have criticized this assertion by Beck arguing that these unevenly distributed risks and hazards are still very much

present (see e.g. Roberts et al., this volume). Some risks in industrial society, such as smoking, were influenced by individuals' own practices. It was possible for the individual to protect him- or herself from such risks. Typical ways of governing risks in industrial society were laws and insurances. Calculations of probabilities were used in risk assessment. In contrast, risks in the Risk Society phase differ from earlier ones. Risks are invisible, global, impossible to demarcate socially or spatially. Scientific and technological developments together with decisions made by politicians and experts not only mitigate risks but also create new risks. Typical risks are genetic engineering, chemical and nuclear industry related risks. Beck calls for new conceptual developments because existing concepts and tools to govern risks do not function (Beck 1992). In addition, Beck emphasizes the importance of sub-politics, i.e. groups outside political parties and parliament, such as environmental movements, which can raise concerns. These groups could alter planned activities themselves. Environmental issues require a more differentiated analysis of politics to enable a whole variety of questions to be taken into account. In addition, the possibility to assess the level of risk that is being produced may contribute to reflexive introspection that Beck regards as necessary in the Risk Society. The call for reflexivity refers to the need to re-orientate modernization towards the side-effects and blind spots that institutions, such as science and politics, have created and which society can no longer tolerate.

Technical and social risk approaches seem to remain separate despite attempts to get them to complement each other. Ortwin Renn (2008) has emphasized the need to combine the technical and social understandings of risk to better understand the nature of risks and the possibility to govern them. Many scholars from different disciplines have acknowledged the need to look at risks from several perspectives to gain better insights into them (Aven and Renn 2010; Löfstedt and Boholm 2009; Reith 2009; Hollnagel 2006; Stoop 2011).

Endeavors to integrate technical and social aspects of risk may face practical problems, which are also linked to different conceptual and ontological understandings of risk. Nevertheless, some basic understanding of what is going on in technical and social risk fields is required to create new insights into risks and resilience.

Since technical risk calculations continue to be a pragmatic tool used to support decision-making, it is important that both the decision-makers and social scientists dealing with risks are aware of technical risk understandings and recent developments in the field. Risk calculations provide estimations that can guide human action and allow interventions (Reith 2009). A better understanding of new developments in risk research provides better grounds for a common dialogue and also new opportunities for social scientists to contribute to the field.

Alternative Risk Thinking Challenges Traditional Probabilistic Risk Understanding

This section examines some understandings of risk and probabilities in the field of technical risk assessment. This will be followed by a depiction of recent developments in this field. There are different definitions of risks in this field. Risk can be seen as a combination of uncertainty and damage (Kaplan and Garrick 1981). In addition, risk has also been defined as expected value loss: the probability of an undesirable event or consequences, the severity of these, and uncertainty (Aven 2014, 231–233).

New insights into the domain of risk assessment originate from the critique of traditional quantitative risk assessment based on the engineering science paradigm. Quantitative risk assessment, with the aim to estimate accurately some underlying risk aspects, has proved to be less successful due to the fact that it is often impossible to provide accurate estimations. The Three Mile Island and Chernobyl nuclear accidents, in particular, evoked discussions about the foundations of risk assessment and risk management (e.g. Kaplan and Garrick 1981). Discussions about the foundational issues of risk assessment were vivid especially in the 1980s and 1990s.

Criticism of conventional probabilistic risk assessment and its weaknesses has led to the new risk thinking that emerged relatively recently within the engineering sciences and in technical risk assessment (Lindley 2006). These new perspectives aim to see beyond probability (Aven 2014, 60).

What does seeing beyond probabilities mean? First, underlying assumptions that affect probabilities and decision-making are made explicit (Linnerooth-Bayer and Wahlström 1991). Thus, an emphasis on uncertainties and knowledge behind probabilities is a core feature of new risk thinking. Second, there is sensitivity to signals of failures and a related readiness to review risk calculations based on new knowledge. Third, unforeseen aspects and potentials for surprises are acknowledged. Therefore, alternative risk thinking also stresses the ability to meet unforeseen events and surprises, in other words, take into account resilience. This involves the ability to change action when needed (Aven and Krohn 2014).

Alternative risk thinking and endeavors to improve the field of risk analysis appear in the form of a new conversation about foundational issues carried out by scholars in the Society for Risk Analysis, which is an important scientific association in the risk field. SRA has published a glossary (2015) that presents the association's view on risks and defines key terms, such as risk, probability, ambiguity, and resilience. The basic idea is to define key concepts but also to allow different perspectives on these. Therefore a distinction is made between concepts and their measurements. Foundational issues entail, for example, the following topics: knowledge and uncertainties, risk management policies suitable for situations with deep uncertainties, societal risk-decision-making, how to take into account early signals and precursors of risk (SRA 2015, Glossary, Aven and Zio 2014).

From this glossary, it is possible to pick up some foundational issues, which are points at which social scientific knowledge and technical risk understanding could cross-fertilize each other. The glossary emphasizes uncertainties and knowledge factors. The traditional consequence-probability approach does not pay enough attention to knowledge or the quality of knowledge behind probabilities. New emphasis on the nature of so called 'weak' or 'strong' knowledge behind probabilities could provide space for fruitful cross-fertilization between the traditional technical risk field and the social sciences. "Weak knowledge" refers not only to a lack of evidence but also to a situation with disagreeing experts about the knowledge and assumptions behind the probabilities. In contrast, "strong knowledge" refers to firm evidence and consistent expert judgements, which support the calculation of probabilities (Aven 2017).

If the probability of a risk is the same for two different events, but the knowledge behind the probabilities differs so that the first event has a strong evidence base and the second event has a weak evidence base, this would have effects on the validity of the calculation not to mention the decision-making involved. In the worst case, the probability of an occurrence of an event, such as a natural disaster, for example a very high tsunami wave, would be estimated as very low and, thus, would not lead to any precautionary measures. A good example of this is Fukushima (Aven 2014). Thus, the degree of the strength of knowledge and evidence in risk assessment and management has concrete societal consequences. To better serve the pragmatic function, to guide human action, it is important to understand the limitations of risk calculations and, at the same time, to strengthen the validity of probabilities. For this purpose it is important to improve our understanding of the role of knowledge.

Social sciences, such as the sociology of knowledge and Science and Technology Studies (STS), could provide important perspectives on the role of weak and strong knowledge behind probabilistic risk assessment. An analysis of the social dynamics of different disciplines and expert communities, with their own norms and rules, would open up relevant aspects related to weak and strong knowledge (see also Lidskog and Sundqvist, this volume). In addition, an analysis of the social diversity of experts (gender, discipline, culture) behind weak and strong knowledge would open up relevant social aspects related to knowledge (e.g. Wynne 1996). It is relevant to look at whether consensus on the level of probability derives from a narrow expert base, or whether several experts from different disciplines and from the general public are involved in the examination. In the latter case, it is likely that more disagreements would occur, but the knowledge base could be stronger. Moreover, a proper social scientific understanding of knowledge requires opening the ontological assumptions related to knowledge and clarifying the relationships between individual and collective dimensions of knowledge, as well as the underlying social, cultural, and political aspects (e.g. Wynne 1996; Tsoukas and Vladimirou 2001; Sarewitz 2004; Renn 2008; Nowotny 2014). Studies on these aspects have been carried out in the field of social sciences, but, in the new context, there would be new openings as well as new interest in these.

The environmental social sciences can, moreover, provide a more nuanced analysis of the role of non-knowledge, which is defined as not just the absence of knowledge but as knowledge of what is not known (Gross 2016). That is critical in the current complex risk context, which requires that decision-makers deal with different kinds of uncertainties. Another important approach from the environmental social sciences is intersectional risk analysis, which has shown how risk management can reproduce privileges and subordination (Olofsson et al. 2016). An intersectional approach focuses on how factors such as gender, class and ethnicity interact in different ways, and an intersectional risk analysis shows how risk discourses are involved in such interactions and in creating various differentiations in society.

Resilience

The concept of resilience has gained popularity over the last couple of decades in ecology (Holling 1973, Folke 2016). Yet, the concept dates back to the first century B.C.; it was used in the poem of Lucretius (Pizzo 2015, 133). It has been used in different ways. For example, in the field of Mechanics it refers to "an ability of a material to return to its original state after being altered, due to the potential energy that has been stored through modification from a previous state." (Pizzo 2015, 133). This capacity has been called the bounce back effect. However, it has been acknowledged that the bounce back effect is not the only indication of resilience. In a constantly changing environment, the ability to find a new balance is seen as a better indication of resilience than returning to an original state, which is often not possible to obtain.

The notion of resilience is argued to be under-theorized even though it has become ubiquitous in many domains, such as risk management in high-risk industries, international finance and economic policy, environmental policy, and urban and environmental security (Pizzo 2015; Walker and Cooper 2011). Unpredictable threats are possible in almost any domain in society, and the need to adapt to these changes by building resilience is emphasized (Walker and Cooper 2011, 2).

Eric Hollnagel is a leading scholar of resilience engineering, which is a new discipline for managing safety in safety-critical organizations and complex systems. Hollnagel has defined resilience in the following way: "Resilience is the intrinsic ability of a system to adjust its functioning so that it can sustain required operations under both expected and unexpected conditions." (2011, 1). The resilience concept entered into the risk field along with the acknowledgment that unpredictable, unforeseen events and surprises will occur. Resilience can be seen as a response or strategy through which a system or community orients towards unforeseen events (Walker and Salt 2006; Pizzo 2015). However, resilience, as intended and planned, is not the only way to view resilience. It can also be seen as an inherent feature of a system (Birkland and Waterman 2009; Folke 2016).

Resilience as a response to and strategy for unforeseen events entails, for example: "the strengthening of the system; diversification of the means for approaching identical or similar ends; reduction of overall catastrophic potential or vulnerability; design of systems with flexible response, options and the improvement of conditions for emergency management and system adaptation." (Aven 2014, 42). In addition, strengthening a system's ability to respond to change by being agile and adaptive is included in resilience strategies (Chapin et al. 2009).

Attractive and Problematic Aspects of the Resilience Concept

A wealth of research related to resilience has been conducted, for example, in relation to climate change and sustainable development (Fiksel 2017; Chapin et al. 2009; Wilkinson 2011; Davoudi 2012; Redman 2014). I will not go into detail in these discussions but will examine, from a general perspective, some points in which the resilience concept with its related assumptions is at odds with the environmental social sciences. Table 4.1 is an outline of characteristics of the concept based on selected literature on resilience (Hollnagel 2011; Redman 2014; Pizzo 2015; Walker and Cooper 2011). These are points to which the social sciences have contributed and could contribute further to the understanding of problems related to resilience.

Table 4.1 Characteristics and critiques of the concept of resilience

Characteristics	Criticism
The concept derives from natural sciences (ecology) and engineering sciences. Resilience as strengthening the ability of individuals or communities to respond to change is seen as positive in itself.	Conservative and neoliberal biases by focusing on adaptation instead of questioning social order and structures
Resilience is taken as a politically neutral concept	Tendency to depoliticize by hiding contentious issues, e.g. by treating unwanted and unexpected events as synonyms
Rests on a system theoretical, mechanistic worldview	No theory on how humans as components of a system can intervene or change the system
Dynamic, multilevel, multiscale	Difficult to govern
Based on complexity theories, which implicate that governance is condemned to fail	Promotes deregulation and governance pessimism

The attractiveness of the resilience concept is related to different aspects. One is that it is easily regarded as politically neutral because it has origins in the natural sciences (Pizzo 2015). That argument refers to the idea that the natural sciences and natural phenomena are often seen as objective and separate from human interests, even though this is not always the case. Moreover, resilient capacities, such as the ability of a system or community to respond to disturbances and crises without changing its basic state, or the capacity of a system to maintain its core functions and integrity in a crisis situation (Chapin et al. 2009) carry positive connotations. Therefore, it is possible to argue that hardly anyone would oppose the positive idea of resilience itself.

However, there are also problematic connotations with viewing resilience as a strategy to respond to crisis and to manage a crisis situation. The resilience concept has been criticized for entailing normative assumptions that resonate with neoliberalism, including an emphasis on the ability of individuals, organizations, and communities to survive despite hard conditions (see e.g. Walker and Cooper 2011). A focus on adaptation capacities, for instance, does not promote questioning attitudes as regards existing social structure and social order. In addition, the resilience

concept is prone to hiding potential contentious issues, such as unwanted versus unexpected events. Unwanted and unexpected events are usually treated equally in resilience literature. If we treat, for instance, hazards derived from mining activities and hazards derived from floods in a similar way, we will obscure the possibilities to see the power relationships and conflicting interests behind the mining activities. Neutral treatment obscures the possibility to question these activities.

Systems theory is the prevailing approach in resilience studies. In the field of resilience engineering, various models have been provided to make organizations more resilient, i.e. capable of preventing disasters and recovering from accidents (Hollnagel et al. 2011). It has been acknowledged that the study of resilience cannot be restricted to technological components solely; organizational and institutional aspects also need to be taken into account (Stoop 2011, 216). This extension of the concept contributes to multidisciplinary research and the involvement of the social sciences. The current tendency within resilience literature is to frame complex reality as "socio-technical systems" including technological, human, and organizational dimensions. However, system thinking easily enhances a mechanical view of the world. In this view, humans remain as merely a passive component of a whole system, and they are not given a proper role for understanding opportunities to intervene or change the system (Pizzo 2015).

Resilience is an outcome of several actions, and, therefore, it is difficult to manage resilience. Studies on resilience have acknowledged that there are several levels (individual, meso, and macro) of resilience and that weaknesses on one level may decrease resilience on other levels (Birkland and Waterman 2009). It is impossible to separate individual resilience from societal preconditions when resilience is understood as a multidimensional and multiscale concept. Vulnerability studies have shown that the ability to adapt to unexpected situations varies across nations, regions, and households. These studies have also found that the capacity to observe and identify worrisome environmental changes is unevenly distributed. Therefore, strengthening resilience requires support from different levels of society as well as from different fields, such as from science, technology, and policymaking (Birkland and Waterman 2009).

Resilience has been used in different ways in different research contexts. It depends on the context and the stakeholders whether dynamic change or preservation of the current state is feasible. Therefore it cannot

be said, in general, that one state of resilience is better than another state of resilience.

With regard to the differences between resilience and sustainability principles, it is argued that resilience thinking treats all events in abstract terms, which is taken as an indication of its analytical capacity. Sustainability thinking, instead, integrates normative values and anticipatory thinking (see also Rau, this volume). According to Redman (2014), resilience thinking aims at incremental change, whereas sustainability thinking leans more towards fundamental change. When resilience thinking aims to build adaptive capacity, sustainability thinking aims to reorder "system dynamics." These characterizations are very general and, therefore, can be criticized, nevertheless, they bring forth some interesting differences between resilience and sustainability.

The resilience concept has been acknowledged to create major epistemological and ethical problems in the context of urban planning. This is because it often leans on the assumption that the world changes in unpredictable ways, and, consequently, the only thing for us to consider is how to adapt to changing circumstances (Pizzo 2015). This view implies that planning and governance are condemned to fail or at least become problematic.

The kind of understanding that governance is condemned to fail provides challenging aspects as regards the governance of risks and safety in the area of high-risk industries, such as nuclear power. Resilience thinking as an answer to complex unforeseen problems seems to hollow out possibilities for proper governance. Obviously this kind of emphasis can be used to promote deregulation. If governance in an uncertain and a complex world is likely to fail, the only option is to continuously adapt to new situations. On the other hand, this kind of thinking may also lead in the opposite direction, such as to eco-fascism. (See also Fisher, this volume on environmental democracy). Resilience thinking refers to the need to accept risk as a permanent condition and recognize that one cannot prepare for negative surprises or catastrophic events fully; there are always limitations (Walker and Cooper 2011, 15). However, the development of strategies that increase resilience and aim to anticipate risks can be interpreted, in contrast, as aims to govern the unknown. For this reason, governance optimism can also be found in resilience literature.

Different Dimensions of Resilience and the Distinction Between Different Types of Hazards

The distinction between human-made hazards and natural hazards has become so ambiguous that it is questionable the extent to which such a line can be drawn at all. For example, climate change is a human-induced phenomenon and, subsequently, floods cannot only be regarded as natural hazards. Despite these limitations, a distinction will be used here to emphasize different political connotations related to the resilience discussion. From the political point of view, there is a difference whether community resilience is discussed in the context of mining-related pollution or in the context of floods or earthquakes.

In the context of mining-related pollution, resilience could be interpreted as disregarding the political decisions, power aspects, and inequalities that have contributed to the situation. Focusing solely on resilience could be interpreted as emphasizing adaptation to a situation without questioning the activities themselves. Thus, the resilience discussion can be seen as depoliticizing the mining activities, in other words, not making the activities a topic for broader public discussion. In contrast, in the context of floods and earthquakes, community resilience can be seen as having a meaningful role. People try to monitor, anticipate, and mitigate natural disasters before they happen, but it is impossible to manage or avoid them entirely. For this reason, there are no similar depoliticization tendencies related to resilience talk in the context of floods compared with mining-related pollution. Thus, it is important to be clear about the context of and connotations related to the resilience discussion.

A distinction between different dimensions of resilience can be made when discussing resilience. Based on Hollnagel (2009, 121), the following dimensions of resilience can be distinguished: (1) learning, which refers to an understanding of what has happened, (2) responding, which refers to knowing what to do, (3) monitoring, which refers to knowing what to look for, and (4) anticipating, which refers to knowing what to expect. Hollnagel's dimensions of resilience are plain and, from a social science perspective, there are additional analytical aspects. A crucial one

is power relationships, for example, who decides which frameworks are to be used when talking about learning, responding, monitoring, and anticipating. Without going deeper into these discussions, one can add some other resilience dimensions, which could be regarded as part of responding, such as the mitigation of occurred harms and adaptation to changing situations. Questioning current ways of acting and changing an action are also relevant aspects of resilience. These aspects represent the reflexivity that Beck calls for.

Relationship Between Risk and Resilience

There are at least two schools of thought regarding the relationship between risk and resilience that approach the risk and resilience nexus in different ways. The first school regards resilience and risk as competing concepts. Resilience is seen as something that can be managed or needs to be created without reference to risk. The first school refers to complexity theories and emergent uncertainties and negative surprises that cannot be anticipated and to which probabilistic risk analysis cannot provide answers (Dekker et al. 2011). References are not often made to risks or risk analysis in the safety sciences.

According to this first school we need to accept risk as a permanent condition and recognize that we cannot prepare for negative surprises or catastrophic events fully; there are always limitations (Walker and Cooper 2011, 15). The complex sociotechnical environment challenges the traditional probabilistic understanding of risk. Risk analysis has been criticized for failing because it cannot predict accidents (Dekker et al. 2011). Instead the concept of resilience has been called for. Resilience refers to acquiring capacities to cope with a situation and to continue with the least possible damage.

In contrast, the second school regards risk and resilience as complementary concepts; risk analysis appears as a crucial part of resilience management (Linkov et al. 2014; Aven 2017). Especially in the identification of threats and stress factors it is seen as crucial to exploit risk analysis. This is because organizations, communities, or ecosystems can withstand certain types of stress factors better than other types of stressors (Birkland

and Waterman 2009). For that reason, building resilience would benefit from an analysis of threats and risks, which could harm the system and against which the system should create resilience. Thus, the second school promotes the idea of including risk analysis as part of the resilience approach. It argues that the resilience approach cannot function without risk analysis and the identification of vulnerabilities (Linkov et al. 2014; Aven 2017).

It is possible to understand both viewpoints. If one takes seriously the idea of the tight interconnectedness of several systems and subsystems that generates complexity, this means that these types of systems are in a continuous process of change, and, therefore, it is impossible to predict what will happen. (Dekker et al. 2011). For this reason, learning also becomes difficult, if not impossible. However, a counter-argument is that several systems are not that complex. Thus, it is possible to adopt an intermediary position and argue that there are, on the one hand, situations in which unknown risks emerge continuously and when resilience needs to be built without leaning on a risk analysis that cannot predict the unknown. On the other hand, in many cases, risk analysis can be a helpful tool in building resilience, such as in the identification of the vulnerabilities of an environment, community, or individual. Assessing, enhancing, and managing resilience would hence benefit from risk analysis. Especially qualitative risk assessment, which reflects upon the known and unknown aspects of event occurrences, can be beneficial to resilience assessment (Aven 2017). Therefore, risk assessment can help communities and organizations anticipate events and, if possible, change their direction and avoid the risk of crash. The anticipation dimension is one essential capability related to resilience (Hollnagel 2009).

Contribution of the Environmental Social Sciences and Disaster Studies to Risk and Resilience Thinking

As previous sections have shown, the environmental social sciences have provided a range of empirical studies and invaluable insights into the concepts of risk and resilience. Cultural Risk Theory, which has contrib-

uted to the understanding of risk as a social construction, will be introduced here. A core theme is how risk as a social construction is affected by different interests (Douglas 1992; Duckett et al. 2015).

Proponents of Cultural Risk Theory acknowledge the importance of quantitative risk analysis. However, they emphasize risk as a social construction, and, therefore, all attempts to exploit quantitative risk assessment as a primary means to determine the worst scenarios and make priorities between different hazards (e.g. related to animal health issues, hazardous chemicals, or socio-technical hazards, generally) are subordinated to social and political interests (Duckett et al. 2015). Thus, Cultural Risk Theory provides a needed contribution and complement to risk assessment. However, the scholarship in combining technical risk analysis and cultural risk analysis is just emerging and needs to be developed much further so that socio-technical hazards in relation to society and the environment can be better understood and dealt with.

The environmental social sciences and disaster studies have provided a multifaceted field for the elaboration of resilience research. Disaster studies have shown how communities differ from each other in terms of physical, biological, social, and cultural resilience factors. Tolerance to a disaster can also be evaluated from different perspectives, such as from ecological, social, cultural, political, economic, and engineering viewpoints (Brown and Westaway 2011). Hence, being resilient from an ecological point of view does not mean being resilient from a cultural point of view. Polluted waterways lead to the disappearance of a fishing culture. Even though polluted waterways can recover after some years or decades, fishing as a profession may disappear in the community.

Studies on food security have demonstrated that the adaptive capacity (resilience) of individuals and households is affected and constrained by social, political, and economic processes. It has been argued that the capacity of individuals to adapt to climate change is a function of their access to financial, social, and knowledge resources. Also structural aspects, such as belonging to a high social class support resilience and the adaptive capacity of individuals and households. Similarly, social capital, networks, and support received through networks are important for resilience (Brown and Westaway 2011) and it can be expected that studies applying an intersectional risk approach focusing on class, gender and

ethnicity would bring important findings and insights into adaptive capacity and resilience.

Resilience and vulnerability would be good to look at in the same study. Often emphasis on vulnerability may obscure the capacity for resilience, and emphasis on resilience may obscure possibilities to see the vulnerabilities of a community. In the end, it is the vulnerabilities of a community that determine whether a disaster will have minor or major effects (Birkland and Waterman 2009). Vulnerability studies can focus on context and human rights, and, in that way, enrich the examination of resilience with broader societal aspects (McLaughlin and Dietz 2008).

Disaster studies have enriched the understanding of resilience by showing the multilayered nature of resilience. Natural disasters have revealed differences in the ability of communities and individuals to respond to unexpected events and to recover from them (Brown and Westaway 2011; Birkland and Waterman 2009).

Disaster studies and the Multidisciplinary Center for Earthquake Engineering Research (MCEER) have contributed to the understanding of resilience by creating the "resilience delta" idea. This refers to three dimensions of resilience, such as the pre-disaster functionality of an infrastructure system, the extent of damage to the infrastructure system, and the speed of recovery of that system. With regard to the recovery of a system, it is possible to differentiate between four aspects of resilience. "Technical" refers to the ability of physical systems to perform to acceptance levels when faced with disaster. "Organizational" refers to managing critical facilities and disaster-related functions and to the ability to make decisions and take actions that contribute to resilience. Social dimensions are understood as measures that contribute to communities and governments to decrease the sufferance of losses in communities and governments due to disaster. The economic dimension consists of the capacity to reduce direct and indirect economic losses due to the disaster. (Birkland and Waterman 2009).

There is a research line in disaster studies that has focused on community resilience. A model called the Disaster Resilience of Place (DROP) consists of disaster preparedness, response, and learning aspects (Norris et al. 2008), similar to Hollnagel's key characteristics of resilience (2009) mentioned earlier.

Environmental change studies deal with adaptive capacity, resilience, and vulnerability as intertwined in various ways. Chapin et al. (2009) see adaptive capacity as the capacity of individuals or groups to respond to, create, and shape variability and change in the state of a system. They identify four key components of adaptive capacity: (a) biological, economic, and cultural diversity, (b) social learning concerning the system and how it changes, (c) experimentation and innovation, and (d) selection, communication.

In sum, the environmental social sciences have made major contributions to the understanding of risk and resilience. Especially Cultural Risk Theory is relevant in showing the significance of human agency and culture in the shaping of definitions concerning risks and hazards. However, the social dimensions of resilience as well as vulnerability aspects must be opened up further. Sociotechnical understanding sets further challenges to the examination of risk and resilience. Thus, there is a lot to study, for instance, how different fields and factors, such as technical, scientific, social, political, and natural, affect community resilience and environment-society resilience.

Conclusion

Risk and resilience are complementary concepts. Understanding the resilience of communities and ecosystems requires the identification of their vulnerabilities, in which risk analysis is important. Risk analysis can support strategic thinking and help communities invest in strengthening weak points and, in this way, build their capacity for resilience. Consequently, vulnerability analysis should focus on context and human rights issues and, in this manner, broaden the examination of community resilience towards societal aspects.

Recent endeavors in the fields of resilience engineering and technical risk assessment to find new approaches to risks and resilience can be interpreted as a call for multidisciplinary co-operation. This opens up possibilities for the social sciences to bring crucial insights into the risk and resilience fields. This is not to say that the social sciences have not already made relevant contributions to these fields, but technical and

social research have continued to exist as separate islands. The technical and social sciences have insufficient understanding of what is happening in each other's fields. More curiosity is needed from both sides. Even though the chances for a fruitful cross-fertilization of the social sciences with the engineering sciences exist, in practice, there remain difficulties in bridging gaps brought about by different orientations and ontological assumptions regarding humans and society.

The field of technical risk analysis operates within a pragmatic and relatively narrow frame and may not be responsive to developments in the field of social sciences. Consequently, conceptions of risk in the environmental social sciences are generally unable to develop links to fields of risk assessment and management. Building bridges between two or more different approaches would be important but also highly demanding.

The contribution of the social sciences to the technical risk field could involve an analysis of the social dynamics related to the weak and strong knowledge behind probabilistic risk analysis, or contribute to the generic understanding of risks. The social sciences would bring important understanding about social phenomena, such as power relationships, cultural and institutional frameworks, values, and practices that affect the prioritization of certain risks and hazards over others, and the social capacity for resilience. The social sciences could contribute to various points in the field of resilience engineering, for instance, by theorizing and analyzing critical aspects further. One of the critical aspects to identify would be the uneven distribution of wealth that creates vulnerabilities that prevent some people and communities from obtaining resources that would be relevant for strengthening their capacity to meet unexpected events and recover from them. The uneven distribution of wealth may have implications for people's ability to observe and inform about worrisome natural phenomenon (see also the chapter on Environmental Justice by Roberts et al., in this volume). These critical aspects show that a study of resilience cannot narrow the gaze to only consider anticipation, because the anticipation aspect of resilience takes attention away from questioning an activity as a whole.

Cross-fertilization between disciplines occurs all the time, and this chapter has shown some points where cross-fertilization ought to be

developed further. The trip won't be easy but will be worth the effort. Vulnerability analysis together with risk and resilience assessment would provide a broader understanding of risks and hazards in contemporary societies. Together these approaches could contribute to the reflexive capacity of our societies.

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5

Global Environmental Networks and Flows Addressing Global Environmental Change

Peter Oosterveer

Introduction

Globalisation should not simply be equated with uniformity and homogeneity, neither with a series of concentric circles or hierarchical levels from the local to the global. Rather, globalisation should be seen as a process of creating multiple connections over time and place at increasing speed and intensity (Massey 2004). As Manuel Castells has argued: globalisation is 'the process of global networking in every domain of human activity' (Castells 2016, p. 8) leading up to the creation of a global network society. In this process of globalisation fixed time and space are increasingly being replaced with relational time and space, which forces social scientists to develop conceptual tools that are better equipped to address these dynamics than conventional concepts that are increasingly becoming 'container'-concepts (Beck 2005), such as the nation-state and

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nuclear family as they suggest stability and permanency where there is rather dynamics and fluidity.

Global networks and flows are suggested to be more appropriate concepts for analysing contemporary societal dynamics than the conventional concepts of social structure and system, which are based on stability and permanency. This seems relevant, in particular with regard to the environmental challenges the world is facing today. Nowadays, many environmental problems are global problems, such as climate change and biodiversity loss, while many regional environmental problems are influenced by global dynamics, such as fresh water depletion in California and Southern Spain as a consequence of producing fruits and vegetables for the global market.

In this chapter I will explore the concepts of global networks and flows and what these may contribute to conceptualising environmental problems and to environmental social sciences more widely. The next section explains these concepts in further detail as well as their utility for analysing contemporary environmental problems. The following two sections apply these concepts in addressing environment-society relationships and in analysing environmental governance. This chapter concludes on discussing the contributions these concepts might offer for the broader social sciences.

Global Networks and Flows Approach to Environmental Problems

Many people are nowadays concerned about the environmental problems caused by palm oil production in Indonesia and Malaysia as tracks of virgin forests are cut for the expansion of oil palm plantations (Koh and Wilcove 2008). Images of orang-utans being threatened generate much protest. However, few realize that about one in every three products in Western supermarkets contains palm oil, from cooking oil to cookies, shampoos and soap detergents. An end to oil palm cultivation would complicate the production of many important consumer products, while replacing palm oil with other kinds of vegetable oil like soybean, rape or

sunflower may lead to other environmental problems. So reducing the environmental impacts from oil palm production is part of a global and complex dynamics, connecting production and consumption practices across the globe (Oosterveer 2015b). Analysing oil palm cultivation as a local Indonesian or Malaysian problem will not provide the necessary insights to identify effective solutions. Therefore, we need more appropriate conceptualizations to which recent developments in social theory might contribute.

In the second half of the 1990s the sociology of networks and flows emerged within the social sciences (Mol 2010; Oosterveer 2009) in response to challenges in addressing the unfamiliar phenomenon of globalization. Where previous sociological theories focused on nation-states as central units of analysis, social scientists like Appadurai, Beck, Castells and Urry, shifted their attention to the transnational networks and flows of capital, people, culture, information, images, and goods/materials. Attention shifted from studying singular units (the nation-state as a container of nearly everything (Beck 2005)) to a focus on worldwide interconnectedness, on the interactions between local and global dynamics and on the hybridization of the social and the material. Environmental sociology has taken up the challenge to 'reconcile social system and network theories with empirical analyses of global material and biophysical flows' (Lenschow et al. 2016, p. 7). In doing so, environmental sociologists expect the perspective of (global) networks and flows to contribute to a more adequate analysis of environmental dynamics in the contemporary era as well as to the identification of more appropriate governance institutions to deal with global environmental flows and the development of more sustainable alternatives.

According to Mol (2010), the sociology of networks and flows brought four important and relevant innovations to explain contemporary social phenomena. First, 'a new kind of time-space organization of practices is introduced that takes globalisation fully into account' (Mol 2010, p. 29). Globalisation is no longer understood as elevating the same processes onto a higher spatial scale, nor as a spatial dimension being developed in opposition to the local, but instead as the growing interconnectivity between different localities whereby the global flows help to produce the local and vice versa (Oosterveer 2009). Second, 'the sociology of networks

and flows lifts the sharp distinction between the social and the material worlds, between flows of information and money and flows of material substance, between the institutional infrastructure and the technological-material infrastructures' (Mol 2010, p. 29). The material and the social can no longer be separated in a meaningful way and should be replaced with hybrid concepts that acknowledge the human involvement in both worlds. Material environmental flows should be understood in terms of their interactions with social dynamics, institutional arrangements and governance structures (Oosterveer 2009, p. 36). This understanding goes beyond a separate analysis of material environmental flows and social dynamics in which the environment is conceived as the passive recipient of social dynamics, while interactions, such as those involving technology and human interventions more generally, are neglected. Thus, a hybrid-based networks and flows approach breaks with such dualistic thinking and allows for insights into how chaos *and* order, local *and* global, social *and* material are interconnected in the formation of the present world. Third, 'the strong separation between the conventional categories of state, market, and civil society is lifted, in favour of all kinds of new emerging hybrid arrangements in-between' (Mol 2010, p. 29). It is becoming less and less clear how networks and flows can be categorised in a straightforward manner in terms of states and markets. Fourth and finally, 'ideas of governance, management, and control drastically change' following the sociology of networks and flows (Mol 2010, p. 29). As nation-states are considered to be losing their effective sovereignty over their national territory and as social and economic activities become more and more de-territorialised, their possibilities for governance and control are seriously questioned.

The strong separation between the conventional categories of states, markets and civil society in (environmental) governance is lifted, in favour of newly emerging hybrid arrangements that recognise complexity and emphasize 'contingency, openness and unpredictability' (Urry 2003, p. 10). Appadurai underlines that global culture should be seen as a complex of overlapping and disjunctive orders, entailing dynamics of both homogenization and heterogenization, that cannot be explained by centre-periphery models (Appadurai 1996). To explore these disjunctures one should look at the relationships between five dimensions of global

networks and flows (or scapes in Appadurai's terms), namely: ethnoscapes, mediascapes, technoscapes, financescapes and ideoscapes. *Ethnoscapes* refer to 'the entire range of human groupings, but privileging in particular mobile groups and individuals' (Heyman and Campbell 2009, p. 145). *Technoscapes* refer to the global configurations of technology and how these technologies move at high speed across various kinds of boundaries. *Financescapes* are used as the dispositions of global capital that are leading to more mysterious, rapid and difficult landscapes. *Mediascapes* refer to both the distribution of the electronic capabilities to produce and disseminate information, which are now available to a growing number of private and public interests throughout the world, and to the images of the world created by these media. '*Ideoscapes* are also concentrations of images, but they are often directly political and frequently have to do with the ideologies of states and the counter-ideologies of movements' (Appadurai 1996, p. 36 (italics added)). Because each scape is subject to its own incentives and to its own and others' constraints, the emerging global scape is not necessarily coherent but, as already mentioned, rather dynamic and disjunctive.

In order to take these dynamics into consideration, concepts of networks and flows are preferred above social systems. In this respect a *network* is defined as 'a set of interconnected nodes', whereby different nodes 'may be of varying relevance to the networks' (Castells 2009, p. 19). And a flow is defined as 'the material arrangements (that) allow for simultaneity of social practices without territorial contiguity' (Castells 1999, p. 295). In the transition to global modernity, transnational networks and flows are increasingly replacing geographically bounded systems and this process is termed by Castells (1996) as the emergence of the global network society, facilitated by the rapid innovations in transport technology and ICT (Castells 2005). Transnational networks and flows constitute a complex structure of communication 'constructed around a set of goals that simultaneously ensures unity of purpose and flexibility of execution by its adaptability to the operation environment. It is programmed and self-configurable at the same time' (Castells 2009, p. 29). Global networks and flows may acquire different configurations, through variations in the size and density of their networked connections as well as through their links with other networks. Networks have become an

efficient organizational form in contemporary society, as three of its features—flexibility, scalability and survivability—are beneficial in the new technological environment. The complex dynamics in the global network society that result from this transformation is partly detached from specific characteristics of time and place. This is emphasized by the introduction of the notion of 'space of flows' (Castells 1996; Mol and Spaargaren 2006). The *space of flows*, referring to the technological and organizational possibility of practicing simultaneity without contiguity and the option of asynchronous interaction, is increasingly replacing the *space of places*, which is based on the continuity of closely inter-related practices, meanings, functions and particular localities. It is important to note, however, that this emerging space of flows is not placeless, but rather that a place receives its meaning, value and function from the relative position (nodal role) it occupies in the wider network and much less from its geographical location. Similarly, where time used to refer to the consecutive ordering of practices in the case of biological and clock time (and even glacial time (Giddens 1990)), the global network society is dominated by *timeless* time, reversing the emphasis on sequencing and acknowledging blurring (on time see also Lockie and Wong, this volume). Information and communication technologies constantly annihilate time through compression and blurring sequences, for instance by linking up with everything that is available on the Internet without considering time of conception and place of origin.

Networks typically have a binary character, which means that networks take into consideration only those nodes (actors and materials) deemed relevant from their internal perspective while the rest is ignored. Global networks and flows encompass nodes whereby the most relevant dynamics are found in the relations between them rather than within these nodes, because nodes are the 'outcomes of networks' (Fuchs 2001, p. 337). Nodes are connected, across time and space, with other nodes through global (material and non-material) flows that may include materials, products, monetary streams, knowledge, information, and energy (Spaargaren et al. 2006a, b). This way, environmental social scientists expand Castells' understanding of flows, because he defines them as 'streams of information between nodes, circulating through the channels of connection between nodes' (Castells 2009, p. 20). Understanding

flows as combining material and non-material dimensions allows environmental social scientists to analyse contemporary environmental problems.

Networks and flows may acquire differently scaled modalities, which for analytical purposes can be categorised as *regions*, *global integrated networks (GINs)* and *global fluids* (Mol 2007; Urry 2003). Regions consist of (im)material flows, material objects, social actors and their mutual relations (networks) that are primarily clustered geographically. Such regions have fixed and solid relations, show 'directional' mobility of the flows and are constrained by clear boundaries (cf. the nation-state). GINs 'consist of complex, enduring and predictable networked connections between peoples, objects and technologies stretching across multiple and distant times' (Urry 2003, pp. 56–57). Such networks are relatively fixed with predictable patterns of exchange and routes of the material flows involved. As a global hybrid, GINs produce predictable material goods and services found to be similar in almost every place (cf. multinational corporations selling uniform products worldwide, such as IKEA and McDonalds). A global fluid (Urry 2003) is less stable than a GIN, involving more flexibility because there are no clear boundaries or stable relations. 'Fluids demonstrate no clear point of departure or arrival and no clear sequential dependency, just deterritorialised movement with no necessary end state or goal' (Mol 2007, p. 302). They 'create over time their own context for action rather than being seen as 'caused' by such a context' and therefore global fluids are considered to be partly self-organizing, while creating and maintaining their boundaries (Urry 2003, p. 60). Examples are global financial flows, the Internet and flows of migrating people. Each of these three modalities involves specific relationships between the network nodes and the material and non-material flows.

Whatever the modality of networks and flows, social actors remain essential in maintaining and (re)constituting the institutions and social practices involved. Networks introduce new actors and new forms of power next to the continued presence of conventional actors and the traditional power centres. Although social actors cannot completely control the complex dynamics in networks, no network exists without human agency either. The complex dynamics in networks are emergent (i.e. a property of the network as a whole but resulting from the actions and

interactions by multiple actors and material processes that themselves do not exhibit this property on their own (Elder-Vass 2010)). Complex dynamics are the consequence of interactions between multiple social actors and the material processes involved (Giddens 1984). The relevance of a particular actor is first determined by his/her inclusion in (or exclusion from) the network and subsequently by the specific position (s)he occupies within the network. Most human actors have a generic position within global networks, for instance the ordinary users of the Internet, without much opportunity to influence the ways in which these networks function or their own particular roles therein. However, some human agents have more influential roles; they are '*programmers*' or '*switchers*' and essential for the continued existence and development of these global networks (Castells 2009).

Programmers and switchers have much more power than those occupying generic positions within networks. Programmers define the network goals and the ways to achieve these by combining information and knowledge, thereby (re)constituting the network itself and establishing its standard modes of operation. The *network power* of programmers concerns their power to make the standards and the protocols of the network, covering the rules which everyone has to follow once part of the network. Programmers define and shape the way in which a network is organised and hence the conditions under which one can be included. Each network has its own specific mode of operation, but programmers always deal with 'ideas, visions, projects and frames' (Castells 2009, p. 46) to generate a network's program. For example, the experts designing the way in which the global financial networks operate are programmers and they do so by developing computer programs for high-frequency trading (Gomber et al. 2011). Programmers closely engage with the processes of communication within a network. Switchers connect different networks by defining common goals and combining resources to strengthen their networked position and their operational effectiveness; switchers control the access from one network to another. Through *networking power,* switchers engage in gatekeeping activities within a network, applying mechanisms of exclusion and inclusion. A classic example is Berlusconi who made connections between media and political networks and was able to generate a high degree of power from this. In other

words, switchers apply the power in a network over whom or what is included or excluded. Connections between networks are constructed through switchers who design and manage specific and rather stable interfaces that allow the articulation of the actual operating system of society at large (Castells 2009). Therefore, although often less visible than the more conventional agents holding economic and political power, programmers and switchers have important power in the global network society. They have steering capacities and the possibilities for creating stability and change in global networks.

Networks, Flows and Analyses of Environment-Society Relations

The sociology of networks and flows introduces a sociological perspective on environment-society relations that includes the material dimensions explicitly, identifies new sources of power, and acknowledges complexity, dynamics and uncertainty while taking a global perspective. Global networks and flows replace conceptualizations that are premised on order and stability, localised production systems and one-dimensional social change. Through its focus on global networks and flows this perspective makes it possible to analyse the involvement of various (governmental as well as non-governmental) social actors in environmental dynamics at different levels of scale. As Mol (2015, p. 11) observes: 'networks and flows of transport and mobility, of energy and other natural resources, of products and services, of pollution and waste, to name but a few, have become architects of the contemporary environmental profile'. Among the most relevant global flows from the perspective of environmental policy, we find material flows (material inputs, people, energy, water, products and finances) and non-material flows (information about product qualities, social and environmental impacts, scientific and technological development, and relevant policies). These material and non-material flows closely hang together as is shown, for instance, in the case of ICT where high energy input is essential to make the global network function although digitalised information seems initially a

non-material flow. Another example can be found in global seafood trade where information about safety and origin is as important as the material characteristics of the product itself along seafood's travel from source to plate.

Flows connect actors and social practices at multiple locations that (inter)act through networks. Actors may be involved in social practices that are directly included in these networks, for instance in food processing and trade in global food supply chains, but also more in more indirect ways, for instance through civil society engagement, scientific research or consumption (Oosterveer and Spaargaren 2011). As the concepts of networks and flows underline, these social actors do not necessarily have to be located at the same place and they may not even be in direct contact with each other. Nevertheless, they engage with the same material and immaterial flows and thereby interact with each other. Each global network and flow entails particular material and associated non-material flows, a particular constellation of actors and practices located in the nodes of the network and with a particular scaled modality. The nodes may be more or less centrally located in the network and some actors may play generic roles while others may play more central roles in programming the networks and in connecting different networks.

This perspective allows for the identification of options and challenges in establishing more adequate environmental governance arrangements that would not have been visible when applying the more conventional concepts. The sociology of networks and flows stresses global dynamics and the connections between material and non-material flows within networks. Studying the dynamic interactions between different localities, between global and local, between social and material contributes to understanding global complexity. The use of these concepts allows for better analysing recent transformations in social reality. Environmental sociologists have applied this perspective in studying the environmental impacts and governance of global commodity networks (Boström et al. 2015). For instance, innovative forms of environmental governance may be identified by analysing the relations between the material and non-material flows and the actors involved in addressing environmental concerns in the network. Examples are environmental labelling and certification (Bush et al. 2015), food waste management (Evans et al.

2012) and studies on global supply networks such as seafood, palm oil and biofuels (Boström et al. 2015; Mol 2007; Oosterveer 2009; Oosterveer 2015b). In these studies global supply networks are conceptualised as linking primary production practices, embedded in the local landscape, with domestic processing and international trade with final consumption and disposal. The global networks and flows perspective encompasses the analysis of different institutions, policies and arrangements, structured at various levels of scale and involving various social actors (Oosterveer 2009; Oosterveer and Sonnenfeld 2012).

A networks and flows perspective is, however, not without its critics and limitations either. Most global networks and flows approaches use a rather structuralist perspective, particularly when they make use of perspectives derived from the domain of Global Value Chains (GVC) (Bair 2009; Bair et al. 2013; Gereffi et al. 2005). When using GVC-based perspectives global networks and flows approaches have difficulties in incorporating the role of human agency in the way these global networks operate. Their focus remains primarily oriented on the more conventional sources and dynamics of power, in particular economic power, and they often subsume programming and switching under these economic power holders. Understanding global value chain dynamics as uniform and structuralist is not necessary as Ponte and Sturgeon (2013) show when they suggests to apply a modular approach to incorporate more flexibility.

Another criticism on global networks and flows concerns their focus on global dynamics whereby they risk ignoring specific local dynamics. The networks and flows perspective has been more effective in studying global dynamics than in the study of everyday consumption and local practices. Especially when faced with environmental challenges, small scale local alternatives are often preferred by many observers as more effective and more inspirational (Kneafsey et al. 2008). Nevertheless, local practices (c.f. Kennedy and Hauslik, this volume) are related to and actually part of global networks and it should therefore be possible to also include them in this framework. One possible strategy for doing so would be to connect the global networks and flows approach with social practice perspectives (Schatzki 1996, 2002, 2011; Shove et al. 2012; Spaargaren et al. 2016). This would entail that a social practice is understood as being

embedded in a network of domain-specific sets of multiple other social practices. For instance, in the case of global supply everyday social practices of consumption could be considered to be embedded in networks with the other social practices of retailing, trading, transportation and processing as well as of primary production. These different social practices evolve in different ways but they remain connected through material (commodity) and non-material (information) flows and wider network dynamics. It might be useful then to reflect further on possibilities of connecting network-related concepts with concepts developed in social practice approaches to deal with relations between different social practices. Examples are bundles of practices, circuits of reproduction, feedback-loops, ecologies of practices and dominant trajectories (Shove et al. 2012; Welch and Warde 2015). This would probably open up opportunities to analyze in a more adequate way how global dynamics relate to local dynamics and how agency can be included in global networks and flows' analyses.

Environmental Governance

Conventional environmental policies based on nation-state institutions no longer match the complex dynamics of environmental problems the world is facing today. The rapid emergence of innovative forms of environmental governance, such as private labelling and certification in recent decades, requires a more appropriate conceptual framework to analyse. Nowadays, environmental governance is becoming a complex arrangement involving many different public and private actors (see also Mol, this volume), each with their own particular goals, means and strategies. Contemporary environmental governance can therefore be defined as 'the formal and informal rules, rule-making systems, and actor networks at all levels (local, regional, global) that influence how societies identify, design, and implement conservation actions' (Alexander et al. 2016, p. 155). Applying the conceptual framework of (global) networks and flows may thus generate a better understanding of the problems and dynamics involved in particular environmental governance arrangements. For instance, in the case of global food provision, like in many

other domains, national governments are no longer the only or the most central regulatory actors. Global dynamics are becoming so complex nowadays that they seem to belie efforts to actually steer them (Urry 2003), at least not in the conventional version of independent states developing policies and implementing them. Since the 1980s, other actors, such as private companies and NGOs, transnational institutions such as the World Trade Organization (WTO), and local authorities, such as municipal governments have become engaged in steering global commodity flows and networks (Sonnenfeld and Mol 2002). The WTO, for instance, imposes strict limitations on what national governments are allowed to do in promoting sustainability in international food trade, as the famous dolphin-tuna dispute between the US and Mexico illustrates. See Box 5.1.

This illustration shows how environmental governance of international food trade may also involve supra-national bodies like the WTO, in addition to national governments. The relationships between governments and supra-national bodies may evolve over time so the resulting governance arrangement is likely to be more complex than conventional

Box 5.1 The Dolphin-Tuna case

In 1988, the US environmental NGO, Earth Island Institute, filed a legal case against the federal government for not implementing its legal obligation to curtail the incidental killing of marine mammals in commercial fisheries. Earth Island Institute claimed that Mexican fishermen were killing dolphins in the Eastern tropical Pacific Ocean, where dolphins swim with tuna. The federal court agreed that the US administration was not upholding the law and ordered Mexican tuna to be banned from the US. In response, Mexico argued that its right to sell tuna in the US had been violated and asked the international trade organization GATT (the predecessor of the WTO) to adjudicate the matter. The Appellation Panel concluded that the US was in violation of its international trade obligations (in the GATT/WTO), but Mexico decided not to pursue the case further and the panel report was never formally adopted.

The case was put to rest until 2008 when the Mexican government argued that the US requirements for labelling canned tuna as 'dolphin safe' were unfairly discriminatory against Mexican fishermen because new techniques allowed them to capture tuna without killing any dolphins. On this basis, Mexico requested the establishment of a WTO panel in 2009 to rule on their complaint. Despite several intermediate outcomes the case was not yet closed by mid-2017 (Oosterveer and Sonnenfeld 2012, p. 70).

nation-state-based arrangements. Next to supra-national bodies, also sub-national bodies like municipalities may become involved in environmental governance. For instance, a growing number of cities are developing their own policies on transport, waste and even food. As they, for instance, expressed themselves in their global urban food policy pact concluded in Milan (2015), cities 'have a strategic role to play in developing sustainable food systems and promoting healthy diets'.[1] So we may conclude that different levels of public government institutions may become involved in environmental governance and that a global networks and flows' perspective offers interesting tools to analyse these transformations.

Next to different levels of public actors, various private actors may also become part of contemporary environmental governance arrangements. Particularly illustrative are the numerous private or public-private initiatives that have been developed in recent years to steer sustainability in different domains. The number of private actors getting involved in such governance initiatives is increasing in recent years. Consumers and end-users of goods and services may become political actors, as recognised in the literature on political consumerism (Micheletti 2003; Stolle and Micheletti 2013). Private companies and NGOs may be involved in value chains governance, for instance through the development and implementation of labelling and certification schemes, the formation of public-private partnerships or the creation of multi-stakeholder platforms. However, this increasing involvement of private actors (companies, consumers and civil society organizations) does not necessarily mean that public actor involvement in environmental governance arrangements is disappearing (Tallontinre et al. 2011). As Carlsson and Sandström (2008, p. 49) argue, 'adopting a network perspective on governance does not necessary eliminate involvement of the state'. However, public authorities are transforming, by being complemented and partially replaced by other forms of authority which are not restricted to the national scale (Sassen 2006). They become one actor amidst a larger arrangement with private actors and they have to accommodate to this changing context. The multiple actors involved in environmental governance entail individuals and collective entities engaging with material and immaterial flows. These governance actors are not necessarily

located in the same place and may not even be in direct contact with each other but they interact within the network. These are networks that are not already fully developed and complete but continuously in-the-making, constituted by human agents through their interactions (King 2010). Global governance arrangements show great complexity and high geographical variation (Glin et al. 2013; Henderson et al. 2002; Sriwichailamphan 2007), covering global production networks, networked regional organizations and transgovernmental networks (Kahler 2009). So, today we are faced with a fragmented, differentiated, hybrid and contested array of global environmental governance arrangements (Lenschow et al. 2016), which constitutes a challenging field of study for social scientists.

Legitimacy of Networked Environmental Governance Arrangements

One of the critical challenges social sciences need to address with respect to innovative environmental governance arrangements is their legitimacy. Contrary to nation-states, global environmental governance arrangements based on networks and flows do not possess an established and recognised legitimacy. Moreover, as they are not based on exclusivity, multiple governance arrangements may be simultaneously introduced to deal with similar environmental problems (Oosterveer 2015a). Each of these initiatives may construct its own particular governance arrangement, justified by its own specific approach, the types of actors involved, and the particular goals, all of which must be legitimated. Legitimacy can be understood as "a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs and definitions." (Suchman 1995, p. 574). When analysing the legitimacy of environmental governance arrangements, we can make a distinction between 'input' and 'output' legitimacy. As Daugbjerg and Fawcett (2017, p. 1225) explain, input legitimacy refers 'to the democratic quality of networks, including their inclusiveness, fairness, accountability, and transparency'. The interventions of nation-states may be considered legitimate based on their sover-

eignty, democratic procedures of decision-making and the presence of an independent legal system to deal with conflicts.

Output legitimacy, on the other hand, refers 'to the effectiveness of networks, including their capacity to solve problems and deliver better policy outcomes' (Daugbjerg and Fawcett 2015, p. 3). Fuchs et al. (2011) find that in the case of global environmental governance arrangements, the input legitimacy is limited. Overall, most network governance arrangements rely more on output legitimacy (Oosterveer 2015a), although the levels of input and output legitimacy vary between different network types. The limited degree of input legitimacy of many network environmental governance arrangements is often discussed with respect to the limited inclusion of actors from the Global South in their introduction and implementation (Belton et al. 2010; Cheyns 2011; Hatanaka et al. 2005). Interestingly, this critique on legitimacy is based on the lack of participation of relevant categories of stakeholders in the development and introduction of global environmental governance arrangements rather than on the non-application of particular rules and procedures.

This discussion on legitimacy is one example of the aspects of network-based global environmental governance arrangements that may be addressed with the help of global networks and flows perspectives. Building on this perspective, further questions may be generated to analyse such governance arrangements (based on (Alexander et al. 2016)):

1. Who is included in the governance network and who is excluded?
2. What are the aims and concerns in the network and how are these institutionalised through network programs?
3. What are the roles of programmers, switchers and other network-actors in connecting the actors in the network and in steering interactions between the different key actors?
4. How do switchers connect different networks?
5. Are the impacts of environmental governance arrangements divided across the network in an equitable manner?

The Case of the Global Palm Oil Network

To illustrate the above presentation and discussion of the global networks and flows' perspective even further, I expand the case of global palm oil provision and governance mentioned at the beginning of this chapter. Palm oil provision is highly globalised, complex and dynamic as it involves many actors in many parts of the world. Most oil palm is grown in Southeast Asia while consumption takes place around the world, in particular in India, China and Europe. Palm oil is highly flexible and may be processed into dozens of different food items, cosmetics, chemical products and (bio)fuels (Thoenes 2006). Producers, processors, traders and retailers constitute a dynamic global network relating to non-material flows of circuitous information on technical specifications, cultural characteristics, food safety and sustainability concerns. Obviously, the network also engages material flows, involving growing oil palm as well as processing and trading palm oil but also its environmental impact. These material and non-material flows connect different actors at different locations who may be involved directly as economic and policy actors in the global supply network, but also more indirectly as NGOs, scientists and consumers. Some of these more indirectly involved actors may nevertheless be key players in programming the network and in connecting different networks as switchers (Oosterveer 2015b). Global palm oil networks may be considered to be quite structured as GINs (Global Integrated Networks) involving retailers and consumers in importing countries, internationally operating processing and trading firms and mills, plantations and smallholders in producing countries.

Because palm oil is highly controversial due to the environmental and social impacts of its production, processing and trade, different attempts have been made to introduce adequate governance arrangements. One example is the Roundtable on Sustainable Palm Oil (RSPO), founded in 2004 with the intention to bring together all relevant private stakeholders around the world to promote economic, social and environmental sustainability in the production and use of palm oil (Schouten and Glasbergen 2011). In just a few years, the RSPO became a central node in the global palm oil network because of its standard defining sustainable palm oil. In this respect, the RSPO has become a programmer in the

global palm oil network and in steering the material (palm oil and palm oil-based products) and non-material (information about the sustainability of growing oil palm) flows. The RSPO also contains switchers such as WWF (Worldwide Fund for Nature) which is connecting the RSPO with the global network of nature conservation initiatives and Unilever which connects the RSPO with several European governments and industries. At the same time, the RSPO is also controversial in different ways. First, the government of Indonesia considers the RSPO as undermining its sovereignty as a producing country. The government has therefore developed its own national sustainability standard Indonesian Sustainable Palm Oil (ISPO) (Wijaya and Glasbergen 2016). Second, the RSPO is seen as ineffective because its sustainability standard is not considered strict enough and its implementation not well-enough enforced (McCarthy 2012). Finally, the RSPO is not considered sufficiently effective because its standard is only really taken up in Europe while the largest importing countries, India and China, are not really interested in securing more sustainability in growing oil palm through buying RSPO-certified palm oil (Schleifer 2016). The global networks and flows' perspective proves useful in analysing these dynamics in global commodity networks and the emerging global environmental governance arrangements, including their challenges.

Conclusion

This chapter explored the development and application of a global network and flows perspective to study environmental change in the context of global modernity. Despite the initial stage of this innovation and the important challenges that remain, this perspective contains the promise that it better conceptualises global-local interactions, for example in complex dynamics such as contemporary food provision. Such a perspective effectively accommodates the complexity, dynamics and multiple levels characteristic of today's food production and consumption networks, among others. Critical challenges for further development of the perspective concern the way the dynamics of everyday practices are

included and the connections and disconnections between material and non-material flows and dynamics.

The second part of this chapter addressed the problem of environmental governance in global modernity and raised the question whether a networks and flows perspective could contribute to identifying more appropriate environmental governance arrangements. It was shown that this perspective allows for better conceptualisation of the emerging global environmental governance arrangements with their flexibility, dynamics and adaptability. Particularly useful is the identification of programmers and switchers, holding network-making power.

By elaborating the networks and flows perspective in environmental sociology, this chapter has also shown this perspective may be appropriate for social sciences more generally. I find the following four contributions in particular promising. First, the relevance of bringing in material dimensions in social sciences. Nature, technology and hybrid socio-material dynamics should be an essential aspect in many more social scientific analysis than is currently the case. Social behaviour takes place in a material context and very often social interaction includes socio-material dimensions. The networks and flows' perspective provides an inspiring example of how material dimensions can be included. Closer connections with actor-network theory (ANT) as developed by Latour (Latour 2005) may be fruitful in expanding this inclusion. Second, networks and flows' perspectives make it possible to bring in the dynamics of time and place more explicitly in social science analysis. This perspective underlines that, in the context of the global network society, time and place become less fixed than before and much a more flexible and relational understanding of these core dimensions of social reality should be taken up in social sciences (see Van Koppen and Bush on spatial structures, this volume, and Lockie and Wong on time, this volume). Third, networks and flows perspectives essentially offer a global perspective on social dynamics because they are based on the recognition of interactions across time and space. This does not mean that all social sciences should only analyse dynamics at the global level but that they always need to take into consideration what global interactions are relevant, even for the constitution and transformation of local dynamics. Finally, networks and flows perspectives place complexity at the heart of their analyses. Its approach

recognises that present social reality is inherently complex, fluid, dynamic and uncertain. This is done by the inclusion of material and non-material flows in its analyses and the recognition that in the global network society new sources of power are emerging: programming and switching. The presence of multiple sources of power evidently contributes to social complexity.

Global networks and flows' perspectives also need to evolve, particularly by accommodating the role of agency in its framework.

Notes

1. See: http://www.milanurbanfoodpolicypact.org/.

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6

The Environmental State and Environmental Governance

Arthur P. J. Mol

Introduction: State and Governance

Since the late nineteenth century, the nation-state has played a major role in protecting the natural environment, being engaged in what Samuel Hays (1987) labelled "Beauty, Health and Permanence". While at first nation-state activities focused on nature protection and natural resource management, especially after World War II environmental protection became a core task of the nation-state (first in so-called developed countries, later also in those in the global South). This resulted in the emergence and proliferation of specialized state environmental organizations, institutions and practices.

For a long time most of the wider literature on environmental protection judged favourably on the role of the state, as it was seen as a vital institution in protecting collective environmental goods, often against

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(globalizing) market forces and private profit. But this simple scheme seems no longer valid and is certainly no longer common sense. Especially since the economic crises of the 1980s and the emergence of what have been called neoliberal governments in the UK and the US, the environmental state has been scrutinized for its actual contribution to and preferential position in protecting the natural environment. A flood of analytical and normative concepts and perspectives have emerged since then to analyse, understand and prescribe the involvement of states in environmental protection, often in relation to or against other major private and public institutions and actors (e.g. Dryzek 1987; Mol and Buttel 2002; Eckersley 2004). This chapter aims to make sense of some of the most prominent perspectives and concepts involving the role of the state in environmental protection, often by explaining them in historical perspective. In doing so, and due to limits of space[1], I concentrate on the environmental state in OECD countries.

The modern environmental state refers to the set of governmental organisations, institutions and practices that have been developed and installed over a six-decade period to cope with the modern environmental burdens. This set of state organisations, institutions and practices differs in form, size, outlook and functioning according to time and place. Hence, the environmental state is not an ahistorical formal category, but rather a substantive one. In its modern form (on which I will concentrate), it developed in the 1950s and 1960s in the OECD countries, spread to wider geographies in the following two decades, and changed in character.

In the next section I will first analyse historically what has happened with the environmental state. Subsequently, I will analyse different—but partly interdependent—sets of literature that interpret and theorize how the environmental state is (and sometimes should be) linked with other actors and institutions in governing the planet: the concept of shifting (environmental) authorities, the concept of (global) environmental governance, and the concept of partnerships. Finally, I will formulate some thoughts on the continuing importance of the environmental state concept, also in times of globalization and 'fluid' governance.

Historical Trends: The Rise and Stagnation of the Environmental State

The idea of environmental nation-state emergence and stagnation can only be understood within a historical perspective. Roughly speaking, the environmental state in OECD countries has gone through at least four phases.[2] In these different historical phases, the outlook and configuration of environmental state institutions reflect the specifics of national historical contexts, policy styles, environmental threats, and national economic and political developments, as various historical and comparative studies of national environmental policy and management have shown (e.g., Hays 1987; Ahuis 2004; Hillstrom and Hillstrom 2010; Steinberg and VanDeveer 2012). Whereas the phases have thus not developed exactly synchronously in all OECD countries, and national environmental state prospects are 'coloured' by national circumstances, for this chapter I sketch the main tendencies and periods and neglect individual particularities and outliers.

Rise, Institutionalisation and Reinvention

Until the late 1950s/early 1960s, most developed states had installed only marginal state organisations and institutions to cope with environmental destruction, often initially at local levels. Nature protection and nature conservation was a main focal point since the late nineteenth and early twentieth century in Europe, the US and Russia, and some national health-related organisations and institutions were in place (e.g., on drinking water, urban waste collection and dumping, workplace safety and health). Alternatively, to put it in Samuel Hays' (1987) terminology, 'beauty' and 'health' received some state attention, but 'permanence' did not (yet). Most of the modern environmental threats related to 'permanence', such as industrial and agricultural surface and ground water pollution, air pollution, toxic chemicals and soil pollution, as well as the more international and global environmental threats, were left unaddressed.

The period from the 1960s until the early 1980s can be labelled the era of establishment and institutionalisation of the modern environmental nation-state. Triggered by wide public protests and the establishment of local and national environmental NGOs, most OECD countries constructed governmental environmental institutions and capacity, such as national governmental organisations (ministries, environmental protection agencies (EPAs) and environmental advisory councils); national environmental laws and regulations; national environmental planning and policy instruments, among which Environmental Impact Assessments (EIA); and national environmental inspection, control and enforcement (see Binder 2002; Busch et al. 2005). These state institutions and organisations were constructed most visibly at the nation-state level, but often had equivalents or operational arms at lower (but not yet higher) governmental levels. The division of tasks and responsibilities between these governmental levels differed by country, depending among others on culture, size and state form.

The 1980s can be seen as a decade of temporary stagnation of environmental state capacity building due to two interdependent reasons. First, the neoliberalisation debates and pressure, most strongly felt in the US and the UK but with wider outreach, hampered further building, expansion and detailing of environmental state capacity (McCormick 1991; Kraft and Vig 2010). Second, disappointment with the results of environmental state institutions and organisations in mitigating environmental crises resulted in debates on environmental state failure (e.g., Jänicke 1986) and reflections on the poor performance of a 'nation-state strategy' in addressing environmental infringements. Budgets, human resources, new legislation and stringent policies stagnated and occasionally came under threat, especially at the national level, marking a type of cap on two decades of rapid environmental state expansion. However, in retrospect, no overall shrinking or decline of environmental nation-state institutions and capacities can be identified in industrialised countries during the 1980s, regardless the frequent reference to environmental deregulation and privatisation in those years (Collier 1997; Mol and Buttel 2002).

The 1990s, then, are marked as an era of environmental state redefinition, reinvention, regained legitimation, and increased power and capacity in two ways. First, the environmental state became much further

embedded in and connected to wider segments of society and the economy. This expanded scope manifested itself in new steering strategies and instruments and in participation of non-state actors in all types of new governance models (see below). These models, strategies and instruments meant a stronger embeddedness of environmental nation-state institutions in societies (including the economy), which further strengthened (rather than weakened or undermined) the operational arms of the environmental nation-state. Concepts of regulatory reinvention in the US (Rosenbaum 2000; Kraft and Vig 2010) or political modernisation in Europe (Jänicke 1993; Van Tatenhove et al. 2000) capture this renovation of the environmental nation-state. Second, international and global environmental agendas emerged strongly, following the 1987 Brundtland report and the 1992 UN Conference on Environment and Development in Rio de Janeiro. The environmental nation-state became refortified and legitimised through addressing international and global challenges via inter*national* cooperation. International environmental treaties (UNEP 2012: 464), international environmental summits, international environmental organisations and networks, and international environmental programs and support mushroomed and further expanded and legitimised the environmental nation-state powers. Most of these international actions were developed, monitored, funded, implemented and verified primarily or mainly through the international state system. Together, these developments set aside debates and questions (of the 1980s) on the need, powers, adequacy and capacity of environmental nation-state institutions and organisations in addressing environmental burdens.

Stagnation

The fourth, current phase in the development of the modern environmental nation-state in OECD countries should be labelled one of stagnation and relative decline of the environmental nation-state. In this phase, the power, capacity and impact of the environmental nation-state in most OECD countries are stagnating (and in particular countries even declining). Alternatively, to put it in terms of Knill et al. (2009), the *density* and *intensity* of environmental nation-state operations is affected. Density

refers to the number of policies and interventions of the environmental nation-state institutions, intensity to the strictness/stringency (or when subsidies are involved, generosity) of environmental nation-state interventions. Indicators or proxies that 'measure' such affected density and/or intensity include: state capacities in terms of number of national staff and budgets at environmental state institutions; the output and innovation of stringent environmental laws, of new, effective environmental policy instruments, and of ambitious environmental plans; effective implementation of environmental state decisions; quality and efficiency of environmental state administration; adequacy of nation-state institutions in addressing new environmental challenges; and relative power of environmental state institutions vis-a-vis other (nation-)state institutions and vis-a-vis major private parties.

However, such indicators/proxies are not easy to quantify and compare across time, and there is little monitoring of such indicators and proxies. Duit (2016) carried out a static analysis of 28 European countries with respect to administrative capacity, regulatory capacity, R&D spending and environmental taxation, categorizing them in established, emerging, partial and weak environmental states. Sommerer and Lim (2016) used the ENVIPOLCON database on environmental outputs to analyse environmental state developments in 37 developed and developing countries. Elsewhere (Mol 2016) I have provided an overview, empirical data and analysis of various attempts to quantitively assess environmental state capacity developments.

In addition to the limited quantitative evidence, there are many qualitative studies that support the observation of environmental nation-state institutions in stagnation. Writing on subjects such as neoliberalising nature (e.g., Castree 2008), policy/governance failure on the environment (e.g., Mercer et al. 2007; Helm 2010), environmental deregulation and privatisation (e.g., Mert 2012), and the hollowing out of the state (e.g., Alfred 2012), numerous authors have identified and analysed the declining authority of central state institutions in handling environmental problems. In these case studies and qualitative evidence, some OECD countries figure more prominently as stagnating/declining environmental states (Canada, Australia, the Netherlands, the US, the UK lately, Denmark, Italy) than others (Germany, Sweden, New Zealand).

Additionally, the case studies point especially to nation-state stagnation and failure for the new environmental agendas that emerged in the 1990s and later. Climate change, biodiversity loss, pollution of the oceans, overfishing of the oceans, illegal trade in waste, and protection of the polar regions are a few of the more recent environmental challenges for which national state institutions have proved not to be the key regulators. Here, state capacity to address these environmental problems is not so much regressing; it has never been built in the first place.

Shifting Environmental Authorities

To understand what has happened over the last two decades in terms of environmental nation-state building and stagnation, the concept of (environmental) authority is useful.

Authority

Even today, use of the concept of authority still refers back to Max Weber's theory of authority (Weber 1947). Weber interpreted authority as the power to command or rule and the duty to obey. But, according to Weber and many scholars following his work and tradition, authority is different from coercive power. In contrast to coercive power authority rests on a certain degree of voluntary compliance, as it exercises *legitimate* social control through a belief system with shared norms. Thus, for Weber, authority is closely bound up with legitimacy: "authority represents a fusion of power with legitimate social purpose" (Ruggie 1982: 398). Weber distinguished three forms of authority: legal authority, charismatic authority, and traditional authority. In modern organizations, bureaucracies and states, legal authority through impersonal principles dominates. Traditional and charismatic authorities have become less important.

Weber's concept of authority has been debated widely, and has been understood in its specific historical context of early twenty century Europe. Hence, his classification of three conventional categories of authority has been widened, as other scholars added different forms or

categories of authority (cf. Guess 2001; Herbst 2003; Hall and Biersteker 2002): epistemic authority (related to science, knowledge and expertise), moral authority (related to widely shared norms and values), media-derived authority (especially relevant in current times of an information society), and illicit authority (of mafias and mercenaries). But the essence of Weber's interpretation and definition of authority still remains valid.

A main line in recent debates on authority questions the idea that authority is very much bound up with the public domain; hence with the functioning of governments and bureaucracies. Limiting authority—or the legitimate right to rule—to the public domain, which is much in line with a Weberian concept of authority, would rule out concepts of private authority. Private authority refers then to legitimate power executed by non-state and non-governmental actors and institutions, such as businesses, market actors and institutions, non-governmental actors and institutions. However, authors as diverse as Cutler and colleagues (Cutler 1999; Cutler et al. 1999), Hall and Biersteker (2002), Ronit (2001), and Sassen (2006), among others, have argued and illustrated that the disassociation between authority and private spheres cannot be maintained. With much empirical and historical detail, these authors have shown that private market authority has existed for a long time in various forms, such as guilds, cartels, and business associations These private authorities were mainly meant to legitimately regulate market interactions and prevent further state intervention in the market, both domestically and later also internationally.

At least since the 1990s it is widely perceived that private market authority is gaining ground vis-à-vis public authority, and that this private market authority is diffusing to spheres that conventionally have been ruled through other—public—forms of authority. Three explanations clarify this perceived shift from public authority to private market authority (cf. Cuttler et al. 1999; Sassen 2006; Spaargaren and Mol 2008). Strongly based in institutional economics is the explanation of higher efficiency and lower transaction costs of private market authority compared to public authority. This is especially claimed valid in settings with international transactions where no centralized political authority exists (which might thus further increase transaction costs when one relies on public authority). The second explanation of this shift relates to

the powers of the architects of private market authority (that is: transnational corporations and their allies), and the power produced through private authority ruling. In quite a number of situations inequalities and structural advantages related to transnational corporations enable the construction and strengthen the implementation of private market authority structures. Third, the growing importance of market authority has been explicated also from a historical perspective. Currently the expansion of markets vis-à-vis states, the furthering of economic globalization and the loss of state sovereignty in a number of domains facilitate the role of private authorities, while public authority comes under pressure. This is further strengthened now that civil society organizations ally with private market authority. The three explanations cannot always be disentangled and strengthen each other in explanatory power. The first two explain why also in previous historical periods market authority existed, and why and how actors press for or seize private market authority. The latter—which basically refers to globalization—helps to shed light on why currently private market authority seems to be starkly on the rise.

Authority and Environment

The idea of different forms of authority enables us to analyse the developments in the role of the state in environmental protection, especially under conditions of globalization. It is under conditions of globalization that environmental authority—in the 1980s still fully belonging to the (formal) public realm and exercised by the state—has been both transformed and relocated. The change, diversification and relocation of environmental authority away from the national state and the political sphere follow also from the deterritorialization and globalization of environmental problems. Different forms of authority (can) have jurisdiction over different territorial expanses. State authorities have jurisdiction over the national territory, which is adequate when environmental polluters and pollution remain restricted to a national territory. But with globalization polluters and pollution are often no longer restricted to and contained in national entities; they are to be found in inter/supra-national

arrangements and in value chains, actor networks and a variety of flows that criss-cross borders (cf. Spaargaren et al. 2006; Bush et al. 2015). Hence, under conditions of globalization and global environmental change environmental authority cannot be limited to what Ulrich Beck (2005) calls the 'nation-state container'. Besides international and supranational state authorities, among which multiple Multilateral Environmental Agreements and the EU, other forms of authority that have a geographically wider stretch become relevant. Market authorities can govern multiple small localities/actors within multiple nation-states. Moral authorities (legitimate power based on disinterested morality of the common good) of non-governmental organisations such as WWF and Friends of the Earth also govern transnationally, across countries. In addition, the authority of city-networks (local agenda 21, climate city networks such as C40) can do so, as well as epistemic communities (with what is sometimes labelled scientific authority; Bijker et al. 2009). Currently—although with national variations in degree and speed—the de-monopolisation and denationalising of state environmental authority in OECD countries can be witnessed through:

- the relocation of environmental authority towards private domains of (transnational) economic networks;
- the reshaping of environmental authority in new public–private arrangements and partnerships;
- the relocation of environmental authority to supranational political authorities; and
- the relocation of environmental authority to individual and organised citizen–consumers, NGO networks and 'informal' political actors.

Thus the demonopolization of nation-state environmental authority comes together with the growing importance of other, non-nation-state forms of environmental authority. It is not that these non-nation-state environmental authorities did not exist under what Saskia Sassen (2006) called national assemblages. But under those conditions they worked largely within and were subsumed and conditioned by a dominant nation-state environmental authority. Many authors claim and show that

the dominance of this nation-state environmental authority is less and less present under current conditions of 'global assemblages' (see also the chapter by Peter Oosterveer in this volume). But with their emergence, diffusion and maturation these other (non-nation-state) environmental authorities are equally tied up with demands of legitimacy and effectiveness in exercising environmental control.

Assessing Shifts in Environmental Authorities

This portrait of stagnating (or even declining) environmental nation-state authority should be qualified on three accounts. First, it remains to be seen how permanent this environmental nation-state setback is. The witnessed decreasing importance of environmental nation-state authority might be temporary, a specific phase in the history of how states handle environmental damage and safeguard environmental quality. Such a temporary setback in environmental nation-state authority, also observed during the 1980s, might be followed by a new phase or reinvention.

Second, a contemporary stagnation in environmental nation-state development does not mean that environmental nation-state institutions have become irrelevant in absolute terms. Decades of environmental state institution building guarantee some inertia and continuity of environmental nation-state authority. Even under today's conditions of globalization, massive 'environmental deinstitutionalisation'—the breaking down and dissolving of nation-state environmental institutions (e.g., Mol 2009)—or environmental policy dismantling (e.g. Korte and Jörgens 2013; Jordan et al. 2013) is still a rare phenomenon.

Third, stagnating or declining environmental authority of nation-state institutions is not automatically problematic for environmental sustainability. Less nation-state environmental authority does not necessarily mean less effective environmental problem solving, control and management. Other institutions and actors, within and outside the environmental nation-state, have taken over functions, tasks, capacities and responsibilities of national state institutions through decentralisation, devolution, integration, privatisation, hybridisation, and internationali-

sation. As Weidner and Jänicke (2002; see also Jacob and Volkery 2006) conceptualise, national environmental capacity is more than nation-state environmental capacity. Solid waste collection and recycling is (partly) privatised to companies; environmental awareness-raising can be and is handled through environmental NGOs and so-called social enterprises; environmental enforcement runs (also) via value chains, insurance companies and private certification organisations and institutions; and environmental licensing and energy conservation programs are decentralised to municipalities. In addition, many scholars note the continuing authority of environmental nation-state institutions as they operate in new environmental governance arrangements (or green partnerships; see below) with other non-state actors and institutions, and with sub- and supranational political bodies (e.g., Conca 2005).

Regardless of these three qualifications, the relocation of environmental tasks and responsibilities from nation-state institutions to other public and private environmental authorities does often go together with—more or less fierce—debates about effectiveness, legitimacy, and equity. But the end result of such relocation is not necessarily an overall lower level of environmental protection, preservation and performance. In analysing empirically the environmental performance data of OECD countries over the past two decades the evidence is mixed. Most scholars agree that there has been a lack of sufficient progress to fully mitigate environmental pollution (e.g., GHG emissions, pesticide use), maximize resource efficiency and recycling (e.g., phosphate, energy, rare earths), and maintain high levels of environmental quality (e.g., air, oceans, soils), either in total, per capita or per unit of GDP. By the same token, hardly any dataset concludes that there has been an overall environmental deterioration in these countries on most indicators. The Environmental Performance Index of the Yale centre for Environmental Law and Policy, for instance, does not show deteriorating environmental performances for the group of OECD countries over the past decade.[3] Hence, we conclude that, although these alternative environmental institutions and authorities are not (yet) performing according to desired sustainability standards, there is no reason or historical 'evidence' to believe that a larger nation-state environmental capacity/authority would have done much better.

Environmental Governance and Partnerships

While sociologists and political scientists often draw on the concept of authority, scholars from public administration, environmental studies as well as environmental professionals use the concept of environmental governance to analyse and explain similar tendencies of a changing role and involvement of nation-state institutions in environmental protection.

Environmental Governance

Without much doubt, since the 1990s the concept of environmental governance has dominated professional and scholarly publications on governing the protection of the natural environment. All textbooks and review articles on environmental governance start with explaining that in analysing and understanding the current protection of the environment the concept of government (or the nation-state) has to be replaced by the concept of governance. Environmental governance is then to be understood as the collaborative efforts, rule systems and networks of multiple public and private actors in protecting the environment. Although the concept of (environmental) governance varies to a considerable extent throughout the academic literature, usually three issues make this concept distinct from its predecessors (Bridge and Perreault 2009: 476). First, the concept of governance explicitly moves away from nation-state centric ideas of regulation and administrative power in governing the environment, and points towards political power and authority at multiple levels (local to global) and across different geographical scales. Second, the concept of governance highlights the obsolescence of conventional analytical categories such as private, public, state, sovereign and government, as these categories can no longer adequately be used to capture and understand governing frameworks, practices and institutions in the current age. Third, environmental governance foregrounds the increasing involvement of non-conventional actors and institutions in governing the environment, among which private for-profit actors (firms, private associations, farmers, utilities, etc.) and market institutions, private not-for-profit actors (environmental NGOs, social movements)

and civil society institutions, supra- and sub-national public actors and institutions, and all kind of in-between actors (social enterprises, government-organized NGOs, etc.) and institutions (partnerships).

This shift has of course not resulted in one universal mode of environmental governance or type of governance arrangement; rather multiple governance forms or modes exist next to each other: for different environmental sectors or domains, in different locations/geographies, at different scales and following different (policy) cultures. Scholars have put major effort in classifying the different modes of governance that have emerged since the 1990s, resulting in multiple classifications. For instance, the NEWGOV (2004) project comes with a classification in which actors involved and steering modes form two crucial dimensions that determine seven modes of governance. Treib et al. (2007) make a differentiation in three dimensions of governance that help us understand the variations in modes of governance: polity, policy and politics. Others, such as Kooiman (2003), Kersbergen and van Waarden (2004), Pierre and Peters (2005) and Jordan and Schout (2006), have proposed different classifications.

Environmental Partnerships

In line with the idea of environmental governance the concept of environmental partnerships—or partnerships for sustainability—has emerged in the literature since the 1990s, to typify the multi-actor character of new governance arrangements. A large variety in partnerships for sustainability can be identified, and a tremendous growth in numbers, especially since the mid-1990s. Environmental partnerships can be defined as collaborative arrangements in which actors from two or more spheres of society (state, market and civil society) are involved in a non-hierarchical process through which these actors strive for a sustainability goal (Glasbergen et al. 2007). Three historical roots are at the origin of the environmental partnership idea and practice, which resembles our analysis of changing environmental authorities above.

First, a fundamental origin of environmental partnerships lies in the idea that the nation-state falls short in the provisioning of collective

goods (see, e.g. Pellizzoni, this volume), in this case environmental quality. Some of the key publications in this regard come from Germany. In *Staatsversagen* Martin Jänicke (1986) analysed the fundamental inability of the nation-state to protect the environment in the 1980s, and called for an innovation or modernization of environmental politics, later to be labelled ecological and political modernization (e.g. Tatenhove et al. 2000; Mol 2002). From the mid-1980s onwards, environmental social science scholars started to develop ideas, investigate practices and formulate theories on collaborative environmental governance. This was helped by the emergence of innovative environmental strategies, among which voluntary agreements, environmental management systems, self-regulation, and labelling and certification schemes. Poncelet (2001), Blowers (1998) and Mol (2007) draw direct lines between these ideas, discourses and practices of political/ecological modernization and the emergence, articulation and functioning of environmental partnerships and co-operative governance.

Second, around the same time (the second half of the 1980s) ideas of public-private partnerships in the provisioning of environmental services (water, waste, energy, etc.) started to develop, especially in the US and to a lesser extent and later in the UK and the European continent. The ideas of partnerships here come from the management and organization sciences (and ideas of New Public Management) and are more focused on efficiency, the bringing in of new capital and the introduction of market logics. These ideas particularly diffused through the involvement of multilateral institutions and banks, and became also prominent after the fall of the Berlin Wall and the transitional processes followed by that event, in Europe as well as in for instance Russia and China (cf. Zhong et al. 2008).

A third historical root of partnership ideas can be traced back in international and global environmental policy-making. In the absence of a global state authority, and with the growing emergence of global environmental challenges in the 1990s, the international and global arena proved particularly fertile for ideas and practices of cooperative environmental governance and partnerships between various state and non-state partners (e.g. Streck 2002). This was strongly pushed by a number of international conferences where the idea of partnership was widely circulated, primarily

the 1992 UNCED conference in Rio de Janeiro and the 2002 summit in Johannesburg (or Rio +10). Especially during and following this last conference a booming of international and global partnerships for sustainable development has been recorded (Commission on Sustainable Development 2006).

Assessing Environmental Governance and Partnerships

There seems to be wide agreement currently that these shifts in governing the environment (towards governance, partnerships and the like) have taken place, be it to a different extent and in different ways in distinct countries/geographies and regarding distinct environmental challenges. But this consensus does not extend to the *assessment* of these shifts towards governance and partnerships. For instance, the partnership literature resembles the positive rhetoric of inclusiveness, collaboration, transparency, redistribution of power, and equity that prevails in ideas of environmental governance (e.g. Davies 2002). But partnerships are also questioned for their ineffectiveness in terms of achieving sustainability goals (Beisheim and Liese 2014), for their (unequal internal) distribution of power and inclusion/exclusion, and for their deficit in accountability and democracy (cf. Glasbergen et al. 2007).

In other words: few scholars and practitioners question the existence of a polycentric environmental governance landscape, with networks, arrangements and partnerships that move beyond the environmental nation-state; but quite some scholars discuss and debate the environmental effectiveness, impact, power and accountability of such 'new' governance modalities and arrangements. Systematic and quantitative assessments of the environmental effectiveness of such governance and partnership arrangements, compared to more state-centric arrangements, are methodologically complex and hardly available. More specific qualitative assessments of some environmental partnerships have been made, but often do not result in strong conclusions on polycentric versus state-centric governance arrangements.

Recentring the Environmental State?

Governing the environment has changed. The almost monopoly of the environmental nation-state (until the early 1980s) is replaced by a polycentric landscape of governance arrangements that strongly includes multiple actors, arrangements and authorities. To some extent this (actual and conceptual) decentring of the nation-state follows from a changing environmental agenda (global environmental change) and a different societal/economic setting (globalization). So this development can be interpreted partly as an adequate 'answer' to a new situation and constellation. In that sense, a return to state-centric environmental governance, prevalent before the 1980s, is both unlikely and undesirable; and hence conceptually problematic. But these developments (and thus the concept of state-centric environmental governance) have also elements of preference, political ideology and choice. I want to conclude with three arguments why a partial recentring of the (concept of) environmental nation-state is valuable.

Environmental nation-state organisations and their officials/representatives appear increasingly to internalise the concepts of network governance, private governance, governance without government, partnerships, non-state-market-driven governance and others; and subsequently change their mode of operation accordingly. This change can be an adequate answer to a new situation and constellation. But it can also follow from a (political) preference to legitimise and prioritise non-interventionist state environmental policies; to mediate in networks instead of designing and implementing stringent environmental policies; to reduce the—until recently strong—core of environmental experts and expertise within the environmental state and maximise the number of managers, mediators and communicators[4]; and to reduce environmental responsibility by outsourcing nation-state tasks to sub-national institutions and non-state parties. Shifts in environmental authority then become an excuse or argument for an absence of environmental ambitions within national state environmental agencies, for a further weakening of environmental state institutions, for non-interventionist policies, for endless mediation and discussion, and for environmentally ineffective devolution and privatisation. In other words, conceptual and actual shifts in author-

ity may then result in a self-fulfilling prophecy of declining environmental state capacity. Specific sectors in society and specific political ideologies cherish and celebrate such developments, emphasising the impossibility of interventionist, preventive and precautionary national environmental policies. In contrast to the environmental domain, there is currently little hesitation within state organisations and among state officials to be interventionist and preventive when issues of terrorism, security, economic stimulation or financial crises are at stake.

Second, the concept of the environmental nation-state needs to be maintained, as it is not interchangeable with other (non-state) environmental authorities in all respects. To be sure, I do not want to claim that states have any pre-given higher morality, normatively preferable place, or formal ahistorical position in environmental protection arrangements. But environmental states and state authorities are fundamentally rather than marginally different from other (private) actors and authorities with respect to, for instance, environmental accountability, control of territory, rule-altering behaviour, democracy and citizenship, and balancing interests. For some environmental problem complexes, legitimacy, accountability, environmental effectiveness, interest balancing and democracy can also be organised and safeguarded to a major extent through, for instance, global private authorities or non-state partnerships. However, in other cases, this is not desirable or possible, or the (non-monetary) costs and external effects would be too high, as among others Seidman (2005), Meadowcroft (2007) and Mayer and Gereffi (2010) argue. In such cases, environmental states must be foregrounded/centred, conceptually as well as in taking the authoritative lead in actions against environmental devastation.

Third, in arguing for a partial recentring of the environmental state, it has to be clear that the outlook, operations and power performance of a contemporary environmental state is different from its predecessor three decades ago. Globalisation requires an outward-looking cosmopolitan state in a transnational state system, not an inward-looking programme of narrow nationalist (environmental) protectionism. Today, adequate environmental nation-states cannot limit operations to the 'nation-state container', but have to actively operate in, 'program' and connect with global networks that handle and manage global environmental flows (e.g.

Castells 2009; Oosterveer this volume). Nation-states do that to some extent with respect to global financial flows and security and terrorism, but not yet sufficiently with respect to governing/regulating global environmental flows and protection. Connecting and programming different global environmental governance networks cannot be left in the hands of private institutions and authority alone. Nor can these be handled by a 'simple modernity' state that is pushed and argued for by current populist movements in Europe and the Americas.

Hence, within today's polycentric landscape of environmental governance arrangements and environmental authorities the concept of environmental state has not become obsolete and is still a useful concept to (critically) study and understand governing the environment. But it has lost its monopoly position and conventional meaning that prevailed under conditions of 'national assemblages'.

Notes

1. The development and form of the environmental state in OECD countries show a large degree of homogeneity, although also within this category differences exist. Some of the arguments and findings on the environmental state in OECD countries have wider relevance beyond the OECD region; but the literature on for instance Asian states (Gilley 2014) and African states (Death 2016) clearly mark particularities of (environmental) states in these geo-political regions that would need a more detailed and specific analysis.
2. I draw here on earlier work (Mol 2016).
3. http://epi.yale.edu/.
4. On environmental expertise, see Lidskog and Sundqvist this volume.

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7

Economic Valuation of the Environment

Steve Yearley

Introduction: Economists Aim to Help the Environment by Pricing It

This chapter argues for and makes initial progress in undertaking a sociology of practices for valuing the environment. In particular, it offers a critical examination of the growth of economic valuations of environmental or ecological 'goods' and makes an assessment of key practical steps in attributing economic values to the environment. It argues that valuation and procedures for value attribution deserve to be considered a key concern within environmental social science. This chapter highlights the fact that, despite the significant growth of sociological studies of environmental topics over recent decades, not enough attention has been focused on the consequences of the ways in which economic conceptualisations and thinking have colonised the environmental sphere.

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Accordingly, attention is here directed at the way in which the environment has been made the subject for economic thinking, at some of the institutions that have grown up around this development, and at the practices of valuation that link everyday actions to economic pricing.

It is uncontroversial to suggest that the idea of interpreting and expressing environmental problems in economic terms began to be popularised around thirty years ago, and economic valuations of ecological issues have played a central role in environmental policy debates for nearly as long. But empirical and conceptual issues around the work of making economic valuations applicable to environmental entities have received relatively little attention within environmental sociology.[1]

Accordingly, this chapter commences with an exploration of the fundamental steps in economic valuations of the environment and of the rationale for their use. It moves on to review some recent ideas from science and technology studies, economic sociology and the social studies of finance which assist in understanding how markets are made and how economic logics are performed. Using examples from the cases of greenhouse-gas pricing and the valuation of ecosystem services, the chapter then analyses areas where the work of valuation is particularly contentious; it shows how social scientific insights are helpful in understanding the social processes by which valuations are arrived at. The chapter concludes by demonstrating how a case has been made for economic valuation to be recognised as a core concern for contemporary environmental social science.

Making the Environment a Subject for Economic Valuation

The core intellectual 'moves' in rendering environmental problems in economic terms are now relatively well known, but they can usefully be quickly summarised. One key principle is to interpret characteristic environmental harms as a form of 'negative externality', a cost or burden imposed on the public good through private actions. On this view, car drivers in urban areas are despoiling the air and thereby they are imposing

'costs' on people's health and wellbeing, affecting urban wildlife, and most likely damaging buildings. But the drivers are not paying the price for this harm since no environmental compensation costs are explicitly included in fuel prices or car taxation (and so on). Nor have drivers typically had to pay more to use their car where it causes most pollution.

To address this problem, economists proposed that environmental 'goods' are attributed with an economic value: that one thinks of clean air or fresh water as elements of natural capital and that one considers the good that aspects of the environment do for society as 'environmental services'.[2] To the objection that the environment is not something that should be valued in economic terms, the counter-argument is that unless an economic value is attached to the environment it will be exploited and over-used. If the worth of clean urban air is expressed in financial terms, then the costs imposed on the city by drivers will be made apparent. Ways can then be found to re-allocate the price of environmental harms to drivers (through road-use permits for example or more sophisticated taxation schemes). This will lead drivers to use their cars less on urban roads and the environment will accordingly benefit.

A very similar logic can be applied to environmental resources: oil in the ground or fish in the sea and so on. Conventionally, these 'assets' are effectively priced only at the cost of extracting them. There is customarily no allowance for the decline in the value of the stock itself, even—in some cases—up to the point of exhaustion of the resource. Quite aside from the climate-change aspects of fossil fuels, the point is that in some obvious sense the world gets poorer as oil is used up (fish too if they are caught faster than they can breed), but this is not reflected in the price of oil-based products. In recent decades, fossil-fuel-based electricity has been cheaper to generate in many locations than most renewable kinds but the situation would in many locations have been reversed had the value of the decline in stocks been costed in to the price of coal or oil.

From the start, environmental economists anticipated objections to their approach. They were keen to point out that they were not trying to shrink the worth of natural riches by putting a money price on them. Instead they were saving the environment from the senseless over-use that was promoted precisely because environmental 'goods' were not priced in

financial terms, because in an economic sense they were 'free'. These arguments have recently been endorsed in a sociological context by Fairbrother (2016) who advocates that sociologists should adopt the term externality in the economists' sense.

In the UK, these arguments were popularised in a series of books associated with David Pearce (starting with Pearce et al. 1989), a celebrated academic economist who was also adviser to the Secretary of State for the Environment under the Conservative government from 1989–1992. In interviews a colleague and I conducted in the UK finance ministry (the Treasury) in the early-mid 1990s, we found that the language of natural capital and even the definition of sustainable development as 'non-declining natural plus cultural capital' had already become widespread among civil servants (Forrester and Yearley 1995).[3] At that time, the UK's leading environmental NGOs were hostile to or ambivalent about such approaches. But by 2013, the former Executive Director of Friends of the Earth in London (Tony Juniper) had authored a popular and successful book (2013, entitled *What Has Nature Ever Done for Us?*) which aims to show (according to the cover blurb) how 'nature provides the "natural services" that keep the economy going'.

These arguments now appear almost obvious and incontestable. Perhaps most famously, this kind of approach was applied to the issue of climate change in the internationally influential 'Stern Report'. Nicholas Stern (2007) used environmental economics to make climate change an issue for bankers, insurers and investors to take seriously. His celebrated assertion, often quoted from the Royal Economic Society public lecture of 2007, is that: 'The problem of climate change involves a fundamental failure of markets: those who damage others by emitting greenhouse gases generally do not pay … Climate change is a result of the greatest market failure the world has seen' (emphasis added). Though the exact economic basis of his calculations has been subject to a lot of technical criticism and debate, Stern's key argument was that thinking of climate change in financial terms allows one to see that the price of tackling climate change—however daunting it looks—is actually small and affordable compared with the costs of not acting.

Finally in this section, it is clear that this is not just a way to couch arguments about priorities and needs. It is not an academic or 'paper'

exercise only. Environmental taxes, aimed at discouraging polluting activities, were already familiar in the 1980s; for example, lead-free petrol (gasoline) was taxed less than regular fuel to encourage motorists to adopt the less polluting alternative. For its part, the idea of pricing has been directly adopted in high-profile environmentally related policies. The first, well known and large-scale application was the approach to acid emissions from US power stations where permits to emit were created and traded. The total permitted amount across the whole sector was gradually reduced as permits were withdrawn year by year. Power stations that polluted less could afford to sell on their unneeded permits and thereby enhance their profits. By contrast, managers of the more polluting plant had to buy additional permits, adding to their costs and making them poor performers in the commercial marketplace. The market in permits encouraged good environmental performance, while the poorly performing plant was marginalised and closed down. Environmental reforms were achieved through the market without the state (and constituency politicians) having to pick winners and losers. Moreover, this was achieved—in the economists' view—in an economically efficient manner: cleaner electricity was produced precisely in those plants where cleaning up was most cost-efficient. Thus the overall energy-generation system was reformed in an environmentally benign direction at something like the lowest possible cost using price signals rather than explicit policy mandates (see the detailed coverage in Ellerman et al. 2000).

Similar arguments have been applied in the carbon dioxide emissions case. They underlay the nearly successful US 'cap and trade' climate policy of the first term of the Obama Presidency (known as the Waxman-Markey Bill, this legislation failed in 2010; see Skocpol 2013 and also Dunlap and Brulle 2015). These arguments also underpin the carbon markets that have come into existence around the world, though most notably in the EU. Finally, ecosystem services (such as the provision of clean water or pollination services) and the value of biodiversity have also increasingly come to be treated in this way. Policies for conservation are commonly expressed in terms of the value of the services supplied by habitats and species, and habitat conservation is frequently said to have an economic rationale.

Theorising Valuation and the Attribution of Economic Values

This trend towards economic valuation—and not only in the environmental realm—is so pronounced that there has not surprisingly been some sociological attention paid to it, and both analysts coming from within economic sociology and from science and technology studies (known as social studies of finance) have been influential. Aspects of the economics literature—as well as the response by ecological economists (see Spash 1999)—have also been important in promoting critical reflection on these moves.

A useful starting point for the present review is the now well-known pair of papers by Çalışkan and Callon (2009, 2010) that focuses on the issue of economising or 'economisation'. This is not economising in the sense of making savings, but the disruptive idea that economists typically approach their work on the assumption that a market or an economy already exists. These authors' point is that in many areas things have to be turned into an economy before the 'laws of economics' have a chance of applying to them. It is this process that they refer to as economisation. Such work on the making of 'economies' is not unprecedented of course; Mulkay and colleagues studied the rise of the discipline and practice of health economics in rather similar terms in the 1980s. Thus, Mulkay et al. (1987) showed how techniques had to be institutionalised for comparing the burden of various diseases and conditions so that economic approaches could subsequently be used to compare the cost of therapies against their typical benefits to patients. New practices for registering and comparing the harms done by worn hips or by diabetes had to be instituted before the average costs and benefits of various treatments could be assessed in economic terms. But Çalışkan and Callon helpfully build a general case for the dependence of economics on the social processes through which markets are made.

A further key contribution to this analytical programme was offered by MacKenzie who highlighted the performativity of economics, meaning by this the way in which economic ideas come into reality only as they are performed by economic actors. Economies are constituted by people and their actions, so that economic laws are performative in a way that, say,

chemical laws are not. In particular, he emphasised what he calls 'Barnesian performativity' (2006, 21) where 'Practical use of an aspect of economics makes economic processes more like their depiction by economics' (2006, 17). MacKenzie's study is primarily about financial economics and the way in which theories about how to value derivatives (and other complex products) have come to shape actors' and institutions' responses to the developing market in just these products.[4] People who believe that a theory prescribes the best way to act (in setting a price or in hedging investment risks) will tend to try to behave more and more in accordance with the theory; in some sense this will make the theory more descriptively accurate and more 'true'.

For his initial studies MacKenzie chose an area where the theory was complicated and actors had to put a lot of work into following its precepts. But one can also observe that environmental economics has a performative component to it. People come to view aspects of the environment increasingly in economic terms and then begin to treat environmental entities as economic instruments. For example, businesses develop that deal in carbon offsetting for flights or taxi trips and so on. Other actors can then trade in this offset carbon. Combining MacKenzie's idea with the approach of Çalışkan and Callon, one can observe that firms, or sub-divisions of existing firms, are set up to trade in carbon futures but this market needed to be constructed as an economic entity before their actions could conceivably take place. In these cases, there would be no scope for the economic activity without the institutions that the economic theory has underwritten. At the same time, the business of trading in carbon futures (say) reinforces the very idea of seeing climate change and excessive carbon emissions as something to be addressed through economic measures.

This focus on the development and imposition of an economic discourse onto environmental entities has also provoked reflection and critique by academics in disciplines close to economics. There is, for example, a tradition—about as old as 'modern' environmental economics—which refers to itself as ecological economics (Spash 1999, 425–430). The distinctive emphasis here is on using ideas from the ecological and other sciences to try to pinpoint what is distinctive about ecological systems as compared with other objects that are made available through markets. The aim is to marry ecology and the other natural sciences with

economics in order to have a quantitatively precise and scientifically accurate understanding of the dynamics of ecological systems. The fact that an early influential text (Georgescu-Roegen 1971) refers to thermodynamics and features the term 'entropy' in its title is indicative of the way in which ecological economists wished to emphasise the distinctiveness of environmental systems.

The operation of economic discourses of value has also been addressed by other sociologists, only loosely associated with the starting points of Callon or MacKenzie, who have begun to study the practical work of attributing value in organisational or accounting contexts. For example, Asdal (2008) has written evocatively of the 'little tools' that link economic precepts to the practical valuations that civil servants and other functionaries have to attach to landscapes or amenities. In a related vein, Fourcade (2011) has examined international comparisons between the ways in which, for example, oil spills are attributed with an economic impact or cost. She highlights the complexity of the institutional arrangements through which values come to be assigned in apparently economically similar countries such as France and the USA. Though economic values are at stake, law courts may play as big a role as markets in arriving at binding valuations of ecological problems.

This kind of approach to the day-to-day practices of value ascription has given rise to a more general interest in the sociology of valuation as exemplified by the founding of the e-journal Valuation Studies (in 2013, see Helgesson and Muniesa 2013). They assert that the journal's raison d'être is 'that "valuation as a social practice" is a specific and interesting topic to study' (2013, 3). Here the focus is on studying more generally the social processes involved in performing valuations; as Dussauge et al put it: "The proposition [is] that we examine *all kinds of values* as upshots of practices … " (2015, 8, original emphasis).

Analysing Valuations in the Environmental Arena

For the purposes of this chapter, directed at arguing for the study of (economic) valuation as a core concern of environmental social science, it is helpful to examine empirical issues around valuation in relation to

two leading contemporary environmental issues. The first, and better known, concerns the attempt to put a price on climate policy options, to develop markets in carbon, to value carbon sinks, and to trade forgone emissions through the Clean Development Mechanism (CDM), Joint Implementation (JI), and associated strategies. The second case has been less discussed in this sense, but it is at least equally critical; it concerns practices of, and concepts for, the valuation of natural resources—especially in relation to ecosystems-services assessments and attempts to "cash out" the value of biodiversity. In presenting this overview, I shall divide the analysis into four thematic sub-sections—the first two dealing with in-principle concerns and the latter pair with issues at the practical level.

Questioning the Appropriateness of Economic Valuations

The first set of key questions is to do with the suitability of economising or implementing a market in environmental goods per se. The doubt is whether a market works in expressing the kinds of value that actors believe should be ascribed to the environment (at a philosophical level this has been a key concern publicised by Sandel, see his 2012). O'Neill had already made this point very starkly two decades ago (1993, 64) when he argued (against cost-benefit-type approaches to valuing environmental goods) that 'The defence of environmental goods requires reference not to preferences as they are, but to preferences as they ought to be'. His concern was that neo-classical economics turns on contingent preferences—people's measured preferences as they happen to be. These are taken as empirical inputs, as a statement of how things are, and then the argument is made that—given what we know about people's preferences—more should be done to protect the environment. But O'Neill is concerned about potential conflicts between preferences and what is good for the natural environment, and he is also worried about the changeability (one might say 'unreliability') and malleability of preferences. This anxiety is shared by many ecological economists who hope to identify scientific reasons why valuations of key environmental goods should be set on a different basis from most other, customary goods.

Responding to the Stern Review on the cost of climate change, columnist and campaigner George Monbiot made a similar point in the *New Left Review* in 2007:

> This methodology leads to a disastrous consequence, unintended but surely obvious. Stern's report shows that the dollar losses from failing to prevent a high degree of global warming outweigh the dollar savings arising from not taking action. It therefore makes economic sense to try to prevent runaway climate change. But what if the result had been different? What if he had discovered that the profits accruing from burning more fossil fuels exceeded the social cost of carbon? (2007, 106).

In effect, Monbiot observes that it is 'lucky' that the figures in the Stern Review worked out in favour of environmental interventions. It is logically possible that they might not have, and that it would be instrumentally rational to put up with extensive climate changes if—for example—the costs of action significantly exceeded the calculated price of adapting to or fixing the likely impacts.

Overall, the anxiety here is that, once the decision is made to express the gravity of environmental problems in economic terms, there is nowhere else to turn if the financial calculation runs against you. If one accepts (however tentatively and unwillingly) that the value of ecosystems services should be expressed in monetary terms, then one is accepting that other monetary values can (potentially) exceed the value of ecosystems. Bees, for example, currently seem very valuable, and the value of the pollination services they provide has been used as a powerful resource in arguing for taking a precautionary line in recent policy debates over what to do about the possible toxic effects of neonicotinoid insecticides (see Juniper 2013, 105). However, if in a thought experiment it turned out that smart, robotic drones were able to do the job more effectively, then bees might lose the benefit of the pollination services they formerly supplied. If bees are valued primarily for the services they supply, when those services are no longer needed bees will see their value wiped out.

This conceptual or philosophical point is aggravated by the observation that prices are not as precise and robust as economic theory seems to

presuppose. In the case of the Stern Review (as Jamieson 2014 carefully demonstrates) the argument over the review's conclusions moved from one about carbon/climate policies to one about the correct discount rate (the extent to which a sum now is preferred over the 'same' sum in the future). Change a few assumptions and the manner in which future harms are costed in today's money, and it can be made to appear overwhelmingly rational to act right away or, on the other hand, to do nearly nothing now and wait for solutions (cheaper, better batteries for example) to come along. Jamieson concludes that economics alone can resolve little about the right way to price carbon emissions because the answer will depend on how one values future wellbeing, and this is an ethical or political issue. If the critical and decisive part of the equation depends on—potentially irresolvable—questions about the correct discount rate, then one cannot easily delegate responsibility for environmental protection onto the market (Yearley 2009). Moreover, as occurred with the Stern Review, a lot of attention passes to clashes over the details of the calculation and away from the specifics of what climate policies to adopt or the societal consequences of environmental change.

How General Is the Applicability of Economic Valuations?

A related issue concerns the extent to which pricing, even if it is suitable for some environmental entities, is applicable to all classes of problems. Early debates here centred on environmental 'goods' for which there was neither a market nor an identifiable 'service'. Many of the knottiest examples came from the field of conservation and had to do with envisaging the value of endangered species or threatened habitats.

Some environmental attributes of this sort could indeed be thought of in economic terms and priced using familiar methodologies. For example, if tourists pay (or invest resources) to visit a place known for scenic or dramatic views then one perhaps has a way of thinking about the value of the landscape to those people; its value is expressed through the amount of money and lost earnings they are willing to commit to visiting it. Similarly, if people now visit the Azores or New Zealand to engage in

whale-watching then one can think about the visitor-value of the wildlife. Accordingly, conservation investments (in preserving habitat and so on) can be shown to be economically rational (or not) and one could even think of 'ecology investment' agencies comparing different wildlife sites and working out where best to get a conservation return for every dollar committed.

There remains, however, the unobserved or perhaps unattractive wildlife, and here the solution seemed to be to talk about 'existence value'. In other words, certain aspects of the environment were to be prized simply for their existence. The economic value of this could only be assessed by carrying out surveys or other price-estimating exercises. Researchers would have to attempt to gauge what people would notionally pay to ensure that species continued to exist or would notionally demand to be compensated for the species going extinct. Jacobs early on (1994) pointed out the drawbacks of such approaches, given apparent inconsistencies in the answers received and also the artificiality of the monetary values when people are asked about the price of something they have no experience of trading in, and in a market with only a make-believe existence.

Additionally, there have been related difficulties with attempts to be precise about the valuation of *all* aspects of ecosystem services. A formulation in terms of 'ecosystem services' came to be preferred to talking of environmental services because it appeared to offer a more specific account of the value delivered (see Mooney and Ehrlich 1997, 11–16). For instance, in the UK National Ecosystem Assessment (2011) services are divided into categories such as 'regulating' (for example regulating rainfall and water run-off) and 'supporting' (the above-mentioned case of the pollination efforts of insects, including bees). The aim here is clear: to be accurate about the kinds of service 'provided' so that a comprehensive, quantitative assessment of those services can be calculated and used in policy decisions. These are essentially accounting measures, designed to separate out the kinds of value delivered to us by natural processes. However, as in other areas of accountancy, there are difficulties about the allocation of services to particular headings and about the amount of interpretative flexibility that exists in the practical business of making classifications (for social studies of accountancy, see Quattrone 2012). To arrive at the 'real' value of ecosystem services, one requires a definitive list

of the sub-types of services and confidence that items have not been double-counted or accidentally omitted. But given the breadth of interpretative flexibility in identifying these categories and assigning bits of the natural world to them, it is not clear that this 'real' valuation can be pinned down in practice.

The continuing salience of this type of problem in obtaining economic values of general utility is helpfully indicated by the way that aspects of the social and cultural value of biodiversity have recently been treated in the UK National Ecosystem Assessment.

The UK NEA was an exercise established in 2007 in response to the House of Commons Environmental Audit's recommendation that the UK Government ought to conduct a Millennium Ecosystem Assessment-type evaluation for the UK to 'enable the identification and development of effective policy responses to ecosystem service degradation' (as expressed on the NEA website[5]). In their *Synthesis of the Key Findings* (2011) the UK NEA attempted, among many other items, to address the religious and spiritual significance of UK ecosystems: this was one of the sub-types of service the natural environment was said to furnish. Their summary asserted that:

> Environmental settings play a positive role in religious practice and faith but more general evidence on their spiritual and religious role is limited.[6]

> *Religious and spiritual goods are clearly linked to our existence need for <u>being</u>, but the extent to which religious encounters with specific environmental settings are synergistic satisfiers for value needs such as participation and identity resides in the character and qualities of belief*. The importance of ecosystems in religious terms had almost certainly increased in the post-war period in Britain, notwithstanding secularisation and the decline of conventional religious observance. There has, apparently, been an increase in the incidence of both pilgrimage and of religious retreats although it is extremely difficult to identify any quantitative measures of this trend. *It is extremely hard to pin-point evidence of particular landscapes or ecosystems being conducive to religious experiences*. (2011, 82–83: italics added, underlining original)

The underlying point that is being made about associations between experiences of nature and some religious sentiments is clearly a reasonable one, and the reported difficulty in finding quantitative measures is understandable.

However, the commitment to an ecosystem services approach leads the NEA authors to offer a curious way of expressing their fundamental point; as cited above, they ask: are 'religious encounters with specific environmental settings … synergistic satisfiers for value needs'? This approach seems to be committed from the outset to reducing religious sentiments to other 'value needs', contrary to what actors themselves seems to feel about the character of religious encounters. Indeed, the subsequent reference (in the passage cited) to 'the character and qualities of belief' rather tends to concede the same point since it implicitly allows that the character of the beliefs *itself* has some explanatory force.

These difficulties in handling religious valuations indicate persistent, profound problems with the generalisability of the framework that requires all values to be expressed in price or quasi-economic terms. On this view, everything that has a value at all must have a value that can be converted into an economic value. This leads analysts either to mischaracterise religious (and other cultural) values by reducing them to economic ones or not to regard them as values in the first place.

How Are Markets Made?

While the first two points are about doubts and contests over the suitability of the entire exercise—the viability of the economistic 'paradigm' so to speak—there are additional problems that seem marginal but are in practice very consequential. These problems arise largely within the paradigm and have accordingly been highlighted by authors from *within* environmental and ecological economics as well as from outside.

One key, indicative issue is to do with the way in which markets are established. Perhaps the best known example here relates to the EU's Emissions Trading Scheme (ETS). The ETS was intended to bring about a reduction in greenhouse-gas releases from the EU by creating a European market in carbon emissions (chiefly to the atmosphere). Actors and insti-

tutions would only be able to make emissions for which they had allowances. Enterprises that managed to reduce their emissions would be able to sell surplus permits, leading the market to favour relatively low-carbon operations and steering the European economy in the correct direction. However, despite elaborate planning and a very large investment in building the apparatus for a market, the market failed in the sense that the price of carbon dwindled and stayed low so that it made little impact on firms' decisions and yielded little financial reward in terms of permit-sales for those adopting lower-carbon techniques.

The ETS was confronted with at least two sorts of problems. First, in the negotiations and haggling through which allowances were determined in the first place, too many permits were issued and firms' projections for the rate at which carbon allowances could reasonably be withdrawn from the system were too limited. Consequently, once the market was in operation few players had trouble acquiring sufficient allowances or adopting relatively cheap measures to stay within their allowances, and the market became otiose (Grubb 2013, 240–244). Moreover, the severe economic downturn from 2007/2008 meant that carbon emissions declined because industrial and commercial activity decreased. The carbon market could add little to this pressure and, in any case, governments were not keen to stifle any signs of economic growth that they could detect. There was an associated fear that carbon pricing might well lead to carbon-intensive industries moving their activities out of the ETS zone altogether, thus saving on permits while limiting Europe's economic well-being, but without reducing overall, global emissions since the carbon would be released in states that imposed no charges for carbon emissions.

Markets may also face design difficulties that lead to unintended incentives arising from the details of pricing mechanisms. Firms and countries have been willing to exploit such 'loopholes', leading to improper profits and the subversion of environmental objectives. Perhaps the best known case here involves a hydrofluorocarbon known as HFC-23[7]. Since they contain no chlorine, HFCs do not damage the ozone layer but they can serve some of the uses formerly met by CFCs in refrigeration and fire-control. However, they turn out to be very potent greenhouse-gases; HFC-23 is well over ten thousand times as warming as carbon dioxide by

weight. Under the Kyoto Protocol, signatory countries could earn credits through the Clean Development Mechanism for preventing greenhouse-gas emissions elsewhere in the world. In other words, rather than reducing greenhouse gases at home, countries could meet some of their targets by paying for the reduction of emissions in other countries (typically in developing economies). In 2007 a controversy arose when *Nature*, *New Scientist* and others reported that the CDM was being employed to pay for the destruction of HFC-23 where it was generated as a by-product from making other refrigerants in China, India and elsewhere. On the face of it, this seemed like a good idea. But the report suggested that something odd was going on since '"HFC 23 emitters can earn almost twice as much from the CDM credits as they can from selling refrigerant gases—by any measure a major distortion of the market," [wrote] Michael Wara of Stanford University, US, in the journal *Nature*' (*New Scientist* 9th February 2007)[8].

The central irony was this. It costs relatively little to destroy HFC-23 molecules in a way agreed as safe, but this hydrofluorocarbon is such a powerful greenhouse gas that the credits for disposing of it are very high. Thus there is a potential economic incentive to generate the gas as a (supposed) 'by-product' simply to attract the credits. Businesses would effectively get paid to make it and then destroy it. Not only is this a foolish use of money, the purchase of these credits reduces the pressure to reduce carbon dioxide emissions in the North since the Northern country is already credited with having eliminated greenhouse gases (the HFC-23)—even if the production of that HFC-23 was only motivated by the existence of the CDM system (on other tensions to which economic transactions around these traded gases give rise, see Bailey et al. 2001).

The publicity around this problem provoked changes to the detail of the credits available for HFC-23 destruction. But the problem of perverse incentives to produce gases that generate profits from their destruction rather than their use has persisted—as recently recorded by researchers from the Stockholm Environment Institute (Schneider and Kollmuss 2015) citing, among others, cases in Russia and Ukraine.[9] More significantly still, this problem is not restricted to carbon markets; in free-market economies commercial actors will be motivated to follow the profits offered within any system of incentives and will look for

opportunities to 'game' the market—often resulting in the subversion of the supposed goals of the system.

The Work Behind Pricing and Selling

The final point to which to draw attention relates to the sociology of the practices that result in the assignment of prices, the determination of taxation levels, or in decisions to trade. In ideal—or idealised—markets, prices arise from the interactions of buyers and sellers. In this model, market participants are well informed, and operate with a shared rationale for conducting trading. But some key environmental markets are far from ideal in this sense.

Actors who are supposed to respond to price signals to steer their environmentally related behaviours may not be experienced or confident in their market responses. For example, it has been suggested that 'pilot' carbon markets in China were less successful than hoped partly because plant managers lacked enthusiasm for trading. It was also in part due to the fact that they were keen to work out what political leaders would like them to do (and then do it) rather than respond to market signals (see Lo 2016, 119). Managers were used to a system of political direction and found it hard to adapt, or to believe that political direction had really been suspended in favour of a market. In this case, organisational sociology and political science are as central as economics to understanding the phenomenon of behaviour in the market.

Similarly, the analysis by Asdal (2008) already mentioned above illustrates a related point. In her work on the 'Little Tools' that enable markets to function in particular organisational contexts, she highlights the administrative practices that allow prices to be attached to specific habitats or to emissions from particular power-plants. Typically, for example, examples of habitats need to be categorised into types and then ranked—by scientific civil servants or by consultants—before economic values can be attached to them and market disciplines applied. Again, and as illustrated by the case of the contested categorisation of peatbogs and their conservation value (Yearley 1989), the values ascribed in a market depend

on these preceding tools and the order those tools create. Economic valuations are dependent upon other, earlier forms of evaluation.

Finally in this section, it should be noted that there is already a strong sense in which mainstream economics itself has moved away from dealing with ideal situations and has concentrated on psychological and even biological dimensions of economic behaviour. Through comparatively recent fields such as behavioural economics (Heukelom 2014) one could say that mainstream economics has become more inductively empirical. But in environmental policy initiatives such as the National Ecosystem Assessment case discussed above, where values are being ascribed to cultural and spiritual benefits not by the actors themselves but by others on their behalf, it is plain that the values arrived at do not have the same kind of empirical warrant. The value-attributions do not arise from market interactions but from different kinds of professional practices altogether. These practices—from surveys through to professional judgements—are clearly a focus for sociological as well as economic investigation. This applies both because higher-level economic calculations may be based on inputs whose origin or original meaning is not really understood by the ultimate analyses, and because there is the possibility that actors are 'gaming' the valuations by attributing values that they hope will influence policy outcomes rather than by trying to assign the most indicative value they can.

Valuation as a Key Concern for Environmental Sociology

Given the spread and wide adoption of economists' versions of environmental value—within governments, firms and NGOs, within international organisations and funding agencies, and within professional training and graduate courses—it is apparent that economic valuation of the environment is now a key component of the landscape of environmental discourse and practice. This chapter has been designed to make a case for economic valuation being recognised as a core concern for the environmental social sciences. At a certain level, sociological studies of the

environment have always acknowledged an economic dimension, notably when considering whether economic growth is inimical to environmental protection. But the focus of this chapter has been different: it has centred on the way in which economists have sought to assist the environmental cause by showing that environmental goods have economic value. As with Lord Stern's approach to climate change, the argument is that environmental economics can show that environmental protection, even major environmental reforms, are economically beneficial.

The analysis offered in this chapter has indicated how the idea of 'economisation' is central to understanding the ways in which economic discourse has been put forward as the authoritative and universal way of expressing the value of environmental goods and benefits. The paper has also highlighted the role of Barnesian performativity, in the sense that environmental actors have participated in rendering the environment a fit subject matter for the application of economic discourse. To think, for instance, of biodiversity and the benefits provided by the natural environment as 'ecosystems services' at all—as services to our way of life—is already to have economised them (see Turnhout et al. 2013).

The paper has also sought to highlight specific empirical areas where the work of valuation is particularly contentious, and where social scientific insights are helpful in understanding the social processes by which valuations are arrived at. These insights matter both conceptually and practically, as has been shown by cases of disputes about the applicability of pricing approaches, and by reports of gaming and malpractice within newly created markets in environmental goods. They also matter to a wide variety of actors, not just to government agencies and the regulators that handle the prices and markets, but to NGOs that worry about embracing environmental economics and to new firms and consultancies which aim to trade in carbon futures or carbon off-setting.

Finally, it is clear that other ways of valuing the environment strongly persist, whether that is in aesthetic or natural-history terms, in novel forms of citizen engagement with environmental options, or in forms of love and reverence for the environment that are hard to express in academic prose. The points made above about the importance of analysing practices for establishing the value of the environment apply in these cases too. There is, most likely, a very broad sociology of ways of valuing

the environment—whether economically, aesthetically, scientifically or in other ways. But this chapter must content itself with a narrower aim—that of establishing economic valuations of the environment in all their various forms as a key focus for conceptual and empirical work in environmental social science.

Notes

1. There are several exceptions here, most of which will be returned to below but see Jacobs 1994 and O'Neill 1993 for early critical perspectives and Sandel 2012 for a very well known, though philosophical rather than empirical, assessment; there is also a growing sociological literature on practices of valuation, ranking and assessment (for example, around indexes and on-line voting and approval systems) which intersects with the points discussed below.
2. In the last decade it has become more common to speak of the services provided as 'ecosystem services' (see Silvertown 2015); the intended implications of using this terminology will be examined later in this chapter. For now, environmental services and ecosystem services can be treated as more or less synonymous.
3. These interviews were conducted as part of the EU-funded project "Environmental Sustainability and Institutional Innovation in Europe" which ran from 1 April 1994 to 31 July 1996; the UK project team was comprised of Steven Yearley and John Forrester. It is perhaps worth pointing out here that the Secretary of State is the normal title for the leading minister within a UK government ministry.
4. In this context, the term 'financialisation' from economic sociology deserves a mention since it draws attention to the ways in which the dominance of mobile, global financial markets has influenced economic trends and the autonomy of political institutions; for an example, see van der Zwan 2014.
5. Consulted on 29 June 2017 http://uknea.unep-wcmc.org/About/tabid/56/Default.aspx.
6. This headline assertion is scored with a '4' in the report indicating that the claim is 'Speculative' characterised by 'low agreement based on limited evidence' (2011, 67).

7. the naming of CFCs and hydrofluorocarbons is complicated but HFC-23 is a simple molecule; essentially a methane molecule with three of the hydrogen atoms replaced by fluorine: CHF_3.
8. see https://www.newscientist.com/article/dn11155-kyoto-protocol-loophole-has-cost-6-billion/ consulted on 29 June 2017.
9. see http://www.theguardian.com/environment/2015/aug/24/kyoto-protocols-carbon-credit-scheme-increased-emissions-by-600m-tonnes consulted on 29 June 2017.

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8

Environmental Expertise

Rolf Lidskog and Göran Sundqvist

Introduction: Expert-Dependency and Expert-Dissolution

Environmental expertise for handling environmental issues is increasingly called for in today's societies. There are hardly any claims of environmental action—be it from governments, environmental movements or private companies—made without reference to expert knowledge. Environmental expertise is a crucial factor in the development of environmental discourses and in regulation—as an epistemic authoritative source providing valid knowledge and measures for handling current environmental problems or preventing new ones from occurring. Environmental expertise concerns epistemic authority in environmental matters and is based on either natural or social sciences, or a combination

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of the two. However, there is surprisingly little discussion about the conceptual meaning of expertise. What does it mean to possess scientific expertise? While it is understandable that the meaning of expertise is not a main topic for natural sciences, it is more remarkable that this meaning is not well developed in environmental social sciences, considering this field's focus on actors and organisations. For example, in environmental sociology, the importance of scientific expertise is stressed but is rarely substantially elaborated (see e.g., Bell 2012; Hannigan 2014; White et al. 2015). Likewise, in empirical research, experts are often used as an important actor category (in addition to environmental organisations, governmental bodies and private companies) but without discussing its conceptual meaning (see e.g., Cordner and Brown 2015; Lorenz and Stark 2015).

Thus, even when expertise is referred to in research, the importance of expertise is often postulated (and empirically illustrated) but rarely explained, leaving several questions unanswered, such as how environmental expertise becomes authoritative, and how its legitimacy can be challenged. We argue that there is a need for environmental social sciences to have a stronger focus on this issue.

A frequently mentioned reason for the importance of environmental expertise is that current environmental threats are increasingly diffuse and beyond the direct perception of lay people. Science is crucial for gaining knowledge of environmental problems, bringing those problems to the awareness of the public, and developing organisational and individual strategies to handle them. Due to the increased role of science and technology, we are, as stressed by Ulrich Beck (1992) and Anthony Giddens (1990), heavily dependent on expert knowledge to know what to avoid and what to do. Organisations and governments make use of expert knowledge as a means of steering society, and we should also notice that knowledge-making and policy-making have become increasingly interrelated and intertwined (Miller 2001; Lidskog and Sundqvist 2015).

However, this view of science-dependent environmental problems is also questioned, and the capacity of science to deliver trustworthy knowledge contested. There are plentiful examples of scientific advice that have been irrelevant or incorrect, and in which citizens' ways of understanding and managing a situation has proved to be more adequate (Irwin 1995; Wynne 2005). Additionally, due to societal development (including mass

education and professionalisation), knowledge and expertise are spatially and socially distributed in society, making it hard to draw and defend strict boundaries between experts and lay people (Nowotny 2001; Irwin and Michael 2003). Instead, today there are a multitude of hybrid practices, networks and assemblages, which destabilise and transcend traditional demarcations between scientific expertise and lay knowledge, as well as between science and policy (Sundqvist et al. 2015). It is important to note that this situation of contested scientific advice and lack of a single centre of epistemic authority rarely implies that expertise is abandoned. In contrast, it intensifies the quest for more expertise—either in an effort to be broader and more inclusive or more science-based and certain.

This chapter is devoted to the elaboration of a sociological understanding of environmental expertise. Expertise is a frequently used concept, but as with many other concepts—such as norms, institutions and practices—it is often used in research without any conceptual elaboration. Nevertheless, there is a constant need for conceptual elaboration and reflection; otherwise, there is a risk that a concept becomes ill-equipped for studying empirical realities.

In our elaboration, we will particularly stress that expertise requires social-material infrastructures, concerns stage management and is context dependent, implying that it is developed in relation to a particular problem area. This requirement means that environmental expertise is socially embedded, presented by actors and conditional in relation to environmental problems. We make use of perspectives and understandings from science and technology studies (STS), and our contribution has importance for this field, for environmental sociology and for environmental social sciences in general. Our focus is restricted to scientific expertise, but there are also other forms of expertise populating the environmental field (including those based in professions outside of science, such as law, economics and public relations).

Our line of argument is as follows: in the next section, we describe the ambivalent and complex situation for expertise in current societies, including the challenge of being called upon by policymakers at the same time as being frequently contested. In the third section, we enter the current discussion of expertise within STS, which includes expertise as an important study object. However, we argue that what in STS is commonly formulated as a conflict between substantive versus relational understanding of exper-

tise should be better understood as particular practices, which involve both social and epistemic aspects. In the fourth section, we develop what this means, including that expertise is always embedded: there is no expertise *per se* but instead concrete environmental expertise that is made possible through epistemic and social infrastructures, by achieving epistemic authority using the help of stage management when developed and enacted within a particular context (problem area). We illustrate our discussion with examples from the issue of climate change. Finally, in the conclusion we stress that environmental social scientists should not take for granted the role of expertise and the formulation of environmental problems but should rather investigate what kind of expertise has been central to the understanding of an environmental problem and the implications of this situation.

An Ambivalent Situation for Expertise

Environmental consequences are often delayed in time and dispersed in space, and science is therefore needed to discover what is at stake (Beck 1992). In addition, "the preventive turn" in much policy-making (for instance, in crime control policies, health regulation and environmental regulation, see Garland 2001; Vogel 2003; Wynne 1992) has meant a strong focus on risks—the potential of future negative consequences to occur if current activities are not changed, which has elevated the need for scientific advice. Environmental risks are conceptualised and measured through scientific practices (such as experiments, modelling, monitoring stations and mapping activities). However, when risks materialize into actual environmental consequences—for example, toxic substances causing ecosystem damages through bioaccumulation—it is hard for experts to trace the causal relations linking emissions and consequences. This development has made scientific expertise crucial for environmental regulation and environmental consciousness, but it has also made it clear that scientific knowledge is uncertain. This ambivalent situation means that science for environmental problems is necessary, yet insufficient and unreliable (Yearley 1991). Today there are a number of general trends and challenges to take into account when pondering the ambivalent situation for environmental expertise, some of the most central of which are as follows:

- *Scientisation of society:* due to social development, including technoscientific progress, almost all parts of life are dependent on expert systems. We have a scientific overflow in society, in which knowledge and products created in laboratories reach society with increasing speed and extent (Jasanoff 2005). A result is that almost all public issues have a scientific component. Additionally, the implementation of new technologies with uncertain implications has led to an increased number of experts called upon by governmental administrations to assess risks and give advice on how to act.
- *Scientisation of politics:* there is increased use of expertise by policymakers, either to guide action or to evaluate (or legitimate) decisions already taken. National governments and international political bodies establish scientific bodies and expert panels with the explicit aim to provide a scientific basis for policy and to evaluate the impact of current policies (Weiland et al. 2013). This institutionalisation of scientific advice requires the enrolment of expertise and the belief that almost all policy needs to be seen as science-based or at least scientifically credible.
- *Politicisation of science:* the increased use of expertise in policy implies not only that policy should be science-based but also that science should be policy-relevant (Lidskog and Pleijel 2011), many times resulting in an epistemic drift, i.e., that policy criteria are used to evaluate what good science means (Elzinga 1985). This quest for policy relevance means that science is drawn closer to policy and thereby may be subject to public and political contestation, which is most easily visible when expertise is invoked in controversial issues, often with the aim to solve these conflicts; scientific experts adapt to what policy actors want and are able to understand.
- *Pluralisation of science:* in many fields, there is a multitude of types of scientific expertise available, representing a diversity of organisations inside and outside academia. This situation is partly due to increased specialisation and partly due to scientific uncertainty combined with a strong focus on policy relevance (Nowotny et al. 2001). Expertise flourishes in many institutional settings, resulting in a multitude of expert messages concerning how to decide and act (Navin 2013). The competition of expertise means that experts may fuel rather than alleviate controversies in policy-making (Nelkin 1992).

- *Contestation of science:* the plurality of expertise also implies a plurality of contradictory knowledge claims. It is rarely possible for science to meet the demands of delivering certainty (including in controversial public issues)—the speed of politics is much faster than the time required to develop consensual and valid knowledge (Collins and Evans 2002)—and many times the credibility of science is questioned.
- *Democratisation of science:* public evaluation, and also often contestation, of science-based regulation and policy-making has led to a plea for democratising environmental governance (Callon et al. 2009; Lidskog 2008). Through inclusive strategies, it is argued, citizens and stakeholders can become involved in the production of knowledge in order to provide science with credibility and policy-making with legitimacy.
- *Transgression of boundaries:* the new, and many times explicit, relations between science and policy—for example, through the establishment of science advisory structures in governmental systems (Weiland et al. 2013; Esguerra et al. 2017)—imply that the institutions of science and policy themselves have changed. The virtual explosion of expert panels to evaluate and guide policy-making has often implied an epistemic drift from science to policy and a changed understanding of how to develop policies, in which it becomes harder to uphold a boundary between science and policy.

Obviously, this list of trends and challenges can be made longer, and those mentioned above are interrelated and partly overlapping. However, the list is long enough to show the complex and complicated situation for scientific expertise being called upon by policy and/or when trying to influence policy. We have a situation in which organisations have to evaluate expert claims and decide between conflicting scientific advice. The credibility, legitimacy, and relevance of expertise are often not taken for granted but must be negotiated. This situation—which is extensively discussed elsewhere (Callon et al. 2009; Cash et al. 2003; Collins and Evans 2007; Nowotny et al. 2001)—results in new conditions for expertise and how to develop guidance in a context of contestation and uncertainty. It is important to note that this situation has implications not only

for the conditions and authority of expertise but also for its fundamental meaning. In current society, what does it mean to possess expertise and what is its social function? To dig deeper into this question, we turn to the discussion in STS, which has vividly discussed the nature of expertise in comparison to environmental social sciences. In this way, we will be able to further develop an understanding of how environmental expertise is achieved, performed and authorised.

What Is Expertise?

A central debate within STS concerns whether expertise is based on the possession of specialised knowledge or on social attribution (Callon et al. 2009; Collins 2014; Collins and Evans 2002; Sundqvist 2014; Wynne 2003). The former position stresses the epistemic content of expertise, as being about individual or collective competence, whereas the latter focuses on social relations, as being about a social position based on attribution. There is no intrinsic contradiction between these two perspectives, and it is reasonable to argue that expertise is both about the possession of knowledge and the external recognition of this knowledge. However, in the current work of STS, there is an unproductive struggle between these two approaches, which we aim to transcend in this section by formulating a position utilising and combining both approaches.

Most dominant in STS is the conceptualisation of expertise as being based on attribution, i.e., expertise is what actors define as expertise. According to this *relational view*, the position, authority and status of experts and expertise is acquired by the social context. To become an expert and maintain expert knowledge is the outcome of social negotiations and boundary-work (implicit or explicit) among involved actors, i.e., to draw the boundaries around what is proper and relevant knowledge and what is not (Gieryn 1999). This means that it is not only the expert community that determines whether it has expert knowledge but also the people and groups outside the expert community, who attribute this role of having expert knowledge to a particular person, group or organisation. The expert community, the strategies it develops and the recognition it receives from others are what constitute the epistemic

authority of expertise. What matters is not knowledge per se but the recognition it receives, not only from knowledgeable peers but also from external actors. The central challenge is how to enhance political legitimacy within the domain of technical decision-making. There are several proposals—such as ethno-epistemic assemblages (Irwin and Michael 2003) and hybrid communities (Callon et al. 2009)—that formulate expertise as part of practices, which include negotiations between different groups, and as knowledge, in which the central problem is to achieve credibility and thereby gain epistemic authority.

The other position, labelled *substantive view*, stresses the epistemic content of expertise. Unique competence characterises expertise, i.e., highly detailed and specialised knowledge acquired through extensive training or practice. Evans (2015: 19) defines expertise as "the property of a social collective [that is] both preserved and refreshed by the member of that group". Based on this definition, expertise is an ability to do something, a competence that can be demonstrated by the individual possessor, and should thereby not be confused with the acquisition of expert status. Expertise is related not to what people and groups inside or outside the expert community believe and perceive but to the competence possessed by the expert community and its members. Expertise can therefore be evaluated independently of the social status given by its social context. The work of Collins and Evans (2002, 2007) is probably the most well-known example of a substantive view, which presents a scheme for different kinds of expertise, and how expertise is separated from non-expertise by sorting out the type of competence involved. The challenge for this view is to determine when and what knowledge is relevant for what purposes. In the table below, we summarise the main differences between the relational and substantive views of expertise (Table 8.1).

The spokespersons for these views frame them as opposites or as one view being superior to the other (Collins 2014; Collins and Evans 2007; Jasanoff 2003; Wynne 2003). In contrast to this perspective, we claim that it is not necessary to make a choice between a relational and substantive view of expertise. Instead, we argue that expertise always has both social and epistemic characteristics. For good reasons, expertise can be defined as competent performances of specific practices within domains of specific cultures (Collins and Pinch 1998). At the same time, there is no expertise if it is not acknowledged, referred to and made use of by oth-

Table 8.1 Overview of the relational and substantive views of expertise

	Relational view	Substantive view
Expertise	An attribution to a collective (outcome of boundary-making)	A property of a collective (specialised knowledge)
Basis	Social relations	Appropriated skills
Problem	Recognition of expert status	Possession of expert ability
Example	Hybrid communities (Callon et al. 2009)	The periodic table of expertise (Collins and Evans 2007)
Critique	Not related to the epistemic	Not related to the social

ers, either inside or outside the expert community. The possession of expertise involves competences *and* performances assessed by others. Thus, to possess expertise means to have epistemic authority, i.e., a social position for authoritatively delivering recommendations within a specific domain, which is the result of both epistemic and social factors. The substantive view is correct in that expertise is about competence, and therefore it is important to recognise that some individuals have more than others. The relational view is correct when arguing that expertise is not absolute; if it is not recognised by anyone, a performance of skilled expertise means nothing. The skills always need a contextual setting in which that expertise is accepted or not, and this setting also strongly shapes what expertise is and should be. We are not all experts—some are more than others (substantive view)—but there is no expert who can claim expertise without recognising the power of others to make the assessment of one's ability to perform expertise (relational view). In short, competence is always performed in a cultural setting.

The Embeddedness of Expertise

Expertise is not only about knowledge, competences and skills but also about social practices, and these practices are assessed by other people, either internal (peer review) or external in relation to the communities producing and developing expertise. Expertise is always embedded in specific situations, which include both the expert practice and the assessment of what it is and how relevant it is. In this section, we will elaborate further on the understanding of expertise, and in particular, we stress three important aspects characterising the embeddedness of expertise: *epistemic*

infrastructures, *stage management* and *contextual dependency*. These aspects are shared by all kinds of scientific expertise: without epistemic infrastructures, there is no scientific expertise; all experts conduct stage management in order to develop and uphold epistemic authority; and all expertise is tightly connected to a particular context (problem area). The first is structural, the second is action-oriented and the third is contextual. Finally, we focus on the specifics concerning environmental expertise: what makes environmental expertise special? From the background of understanding expertise as both substantive and relational, and focusing on its embedded character, we characterise environmental expertise as an effort to match knowledge with environmental problems and therefore strive for a position as a problem solver in the environmental field. Thus, all expertise is context dependent, and what is special about environmental expertise is that the environment is a central part of this context.

Epistemic Infrastructures

Expertise is not developed in a vacuum; rather, it is made possible through and shaped by *epistemic infrastructures.* A material infrastructure provides the instruments, devices and artefacts necessary for knowledge production and distribution. For scientific expertise, a laboratory is probably the most well-known and visible, but not the most frequently used, example of epistemic infrastructures (Latour and Woolgar 1979). Technical devices for data analyses, computer programmes for integrated assessments, textbooks, scientific journals, databases and archives are other examples, i.e., objects and artefacts necessary for achieving and maintaining expertise. However, there are also social infrastructures that provide educational and training opportunities, through which skills, methods and know-how (including tacit knowledge) are appropriated. There is no other way to acquire expert knowledge than through learning, socialisation, group belonging and shared culture. The belief that expertise is based on specialist competence implies the importance of socialisation. To have specialist knowledge means to belong to a group of specialists, who have collectively and individually been trained to become specialists. In this respect, Collins and Evans (2002: 242) stress the importance of a

"core set": the group of experts recognised by the expert community as being the most knowledgeable in a certain area. If there is such a core set (which is rarely the case when experts disagree), there is a centre of expertise and decisions concerning this kind of knowledge, which can credibly be delegated to these experts. Thus, group belonging and recognition are not only important in becoming and being an expert but also constitutive of the very existence of expertise. These relations are most visible for scientific expertise, which is obtained through education (PhD-programmes), training opportunities (post-doc positions, research projects, participation in conferences and networks) and socialisation (being part of a research group). Through involvement in an epistemic culture, embodied skills and practices are shaped, creating a group of scientific experts committed to exploring and interpreting a particular aspect of reality in a similar way (by creating a shared epistemic object) and thereby shaping authoritative knowledge claims (Knorr Cetina 1999). These processes of knowledge development are clearly about both epistemic and relational aspects.

This point is visible in the current shaping of environmental expertise on the international level. For a number of environmental issues, international expert organisations have emerged with the explicit aim to make science more accessible, visible and policy-relevant (Beck 2015; Jasanoff and Martello 2004; Mitchell et al. 2006; Turnhout et al. 2016). This aim is mainly achieved in global and regional assessments of particular environmental problems. There is an increasing number of environmental scientists, connected to large-scale epistemic infrastructures, devoted to the issue of providing decision makers with scientific guidance on how to handle global environmental matters, i.e., synthesising knowledge for policy purposes.

A closer look at these efforts shows that they are structured in a more bureaucratic way than regular research practices. They have more formal rules and administrative hierarchies, including written guidelines on how to select members and perform the review work on what knowledge to include and how to summarise relevant knowledge within a restricted area (Barnett and Finnemore 2004). There are rules for how members (experts) are appointed, which epistemic area they should cover (doing assessment work) and with whom they should interact to perform this

work (Gustafsson and Lidskog). A clear example of this process is the Intergovernmental Panel on Climate Change (IPCC), the most well-known of international expert organisations today. Its activities are clearly structured, including the selection of individual scientists and the approval of the outline of the work and final reports (Lidskog and Sundqvist 2015). Government representatives decide on the scope of the assessments and approve the outline. Thereafter, scientists prepare a first draft that is reviewed by peers; then, scientists prepare a second draft that is reviewed by both scientists and government representatives. Finally, scientists prepare a final draft that must be approved by government representatives before publication (Sundqvist et al. 2015).

Thus, these kinds of expert organisations can be seen as machinery for shaping international environmental expertise. This expertise is constituted by a particular epistemic infrastructure, both material and social, that structures the epistemic and social practices that enable and restrict the role of an environmental expert.

Stage Management

Authority is a relational concept, since it is always gained from others. To be an expert involves being a member of a specialist community (sharing, maintaining and developing its skills and competences) but also being seen as trustworthy by those outside of this specialist community. To possess expertise means to be subordinated to a collective stock of knowledge, which means that experts need to articulate statements and perspectives that are in line with the specialist community; otherwise he or she will lose internal credibility. At the same time, to obtain internal credibility is not sufficient to claiming expert status; the knowledge at stake has also to be recognised as authoritative in wider circles of people and organisations. This balance is interrelated and dynamic and to possess epistemic authority means to be seen as credible by both internal peers and external actors.

A striking example of how expertise must strive to achieve authority is the so-called *Climategate* scandal in 2009 (see Beck 2012 for a detailed discussion). The hacking of a server, which released mails between

world-leading climate scientists, showed, according to climate sceptics, that scientists had manipulated or hidden data in order to prove that the earth's temperature was increasing. A number of investigations that found no evidence of fraud or scientific misconduct were undertaken, but this case shows nevertheless the intricate balance between internal and external credibility; it is not sufficient to have specialist skills. To become an expert, there is also a need to achieve and maintain external credibility.

As studies have shown, experts consciously employ *stage management* to meet the expectations of other actors (such as governments, industrial corporations, environmental movements, and the public), thereby increasing the possibility of influencing them (Hilgartner 2000). Backstage management is the process of knowledge production, which entails dealing with the uncertain, controversial, and risky aspects that are always an important part of knowledge production, whereas front stage management is the content made public to outsiders or the image of expertise it strives to communicate and distribute, e.g., should uncertainties and conflicts be highlighted or hidden? Through stage management, scientific experts can choose between presenting themselves as being certain and independent of political considerations or as uncertain, and working in close collaboration with stakeholders and policy-makers. For instance, we can expect experts to be more open about uncertainties in backstage presentations than in front stage performances. The fundamental objective of stage management is to make expertise externally credible, thereby becoming an authoritative source for what knowledge is important and relevant and for giving advice on what actions are needed. There is no single recipe for how to successfully perform stage management. In contrast, the management is highly dependent on what actors want to hear, i.e., stage management is a relational activity.

Contextual Dependency—What Is Environmental Expertise?

Expertise is context-dependent; it is developed in a specific context and in relation to a specific problem. For environmental expertise, the environment is part of this context, but not in the simple way of an unmediated biophysical reality that determines the character of expertise that emerges.

In contrast, environmental sociology frequently stresses that environmental problems are not external to society but are shaped in a process involving environmental changes, technical artefacts, human activities, social institutions and cultural beliefs (Lidskog et al. 2015; White et al. 2015). Therefore, there is always a need to investigate how an environmental change has been discovered and how it has become an environmental problem, and through which practices and measures it has been discovered, defined, made knowledgeable and understood as a problem (Callon 1980). These epistemic practices do not only open up spaces for developing knowledge on a particular problem but also provide directions in which solutions should be sought (Asdal and Marres 2014; Callon et al. 2009).

However, this discussion does not imply that environmental problems are simple reflections of knowledge practices such as measurement and modelling. Knowledge and expertise are crucial for understanding most environmental problems, but there are also many other practices at work in identifying and knowing environmental problems. In very few areas do scientific experts have a monopoly on understanding an environmental problem. There are often multiple practitioners with different knowledge specialities involved in gaining and presenting knowledge of the problem at stake. For example, the IPCC Working Group II (which assess the impacts of climate change) has increasingly included input from citizens and local planners. However, these voices are mediated by those representing social science studies, in which local opinions on, for example, flooding and sea level rise are described.

Typically, in the environmental field, the epistemic objects are open, question-generating and complex (Knorr Cetina 2008: 89). Thus, even if there is a stabilisation of an environmental problem—a shared understanding of its character, causes and possible remedy—it is temporary and inevitably subject to change, at times dramatically and in unforeseeable directions.

Thus, from the above discussion it is now possible to say something more specific about what is special about environmental expertise. As in all types of expertise, it concerns both competence and recognition and it is always contextually embedded. Environmental expertise cannot be understood as independent from the environmental problem it addresses. However, there is no simple, single or pre-given connection between relevant expertise and particular environmental problems because these factors configure each other in a dynamic way. This process is visible in the

trajectory of the problem of climate change. Originally climate change was presented and developed by scientific experts using calculations and modelling to show the increasing amount of greenhouse gases in the atmosphere and its consequences (Edwards 2010). Since then, other disciplines have been involved and a more complex problem has been constructed, in which the problem definition has broadened to concern not only an atmospheric problem but also numerous other aspects, such as ecosystems, social vulnerability and economic incentives. There is a mutual dependency—co-constitution—of environmental expertise and environmental problems. This dependency does not mean that there is no room for strategic manoeuvring—existing expertise may draw sharp boundaries of how to define a problem, thereby leaving little room for new disciplinary expertise to enter the area. However, at the same time, changes in environmental conditions, scientific discoveries, public pressures and policy regulations may provide opportunities for new directions in research and the inclusion of new disciplines in a particular environmental problem area. Climate change is only one example, in which a complex process of science and policy has resulted in opportunities for new experts. Since the 1990s, economists have had great impact on the development of international climate policies, including its development of policy instruments such as carbon taxes and emissions trading. Thus, it is neither environmental expertise located outside an environmental problem that suddenly recognises an environmental change nor an environmental change that demands society to develop a specific expertise.

To summarise, environmental expertise is always contextually embedded. To possess environmental expertise means to have access to specific epistemic infrastructures and to present knowledge (i.e., perform stage management) in order to achieve credibility, both internally (i.e., towards the expert community) and externally (i.e., towards groups to which expert advice is directed). Expertise concerns a particular area and is related to a particular environmental problem. This interrelatedness is visible in one of the most well-known examples of environmental expertise: the IPCC. The Panel provides not only a way to recognise and define an environmental problem (that of climate change) but also a way to shape expertise by developing an epistemic infrastructure for global assessments, recruiting scientists to conduct these assessments, and performing stage management for achieving and maintaining internal and

external credibility. In this sense, expert communities function as machinery not only for expert advice but also for shaping expertise. At the same time, it must also respond to how actors, such as government representatives, frame the problem of climate change and its consequences, i.e., what they are interested in knowing more about. The aim of the IPCC is to summarise science in a policy-relevant way for government representatives, and this objective indicates the need to reflect on the problem of climate change beyond the object of research.

Conclusion

Expertise always concerns epistemic authority. It is about having the skills and competence necessary to properly perform in accordance to specific community-based disciplinary rules. However, it is also about maintaining a social position for authoritatively delivering recommendations within a specific domain; this position is developed in a particular setting and in interaction with organisations and groups. This process implies that expertise is always embedded. Concerning environmental expertise, there is no general expertise for all kinds of environmental problems; environmental expertise is always closely related to the problem it aims to solve. We stress that this relation is not unilateral but rather dynamic and interdependent; it is neither environmental expertise that determines how an environmental problem is understood nor environmental problems that determine what expertise is required. Environmental expertise and environmental problems are mutually shaped, i.e., co-produced.

A *first* conclusion is that expertise should not be understood in the abstract without any relation to the context in which it flourishes (or disintegrates). A *second* conclusion is that expertise should never be solely defined by the interests and beliefs of the experts themselves. Instead, the shaping of expertise is a broader interactive process, including epistemic content, a specific environmental problem (or problem area), technical artefacts, social institutions, cultural beliefs and stage management. A *third* conclusion is that expertise is dependent on epistemic infrastructures. Irrespective of whether the expert organisation includes only scientific expertise or other knowledge systems, there is always a need to establish procedures for collecting, processing and assessing data and knowledge. Without any practi-

cal ways to handle knowledge—including when it arrives from different knowledge systems—it is hard to put words into practice. This observation leads to a *fourth* conclusion, the importance of institutional design. Earlier ways to conceptualise and research a particular environmental problem have resulted in institutionalised understandings, epistemic infrastructures and communities of expertise, which push research in certain directions, of which the IPCC is a clear example. Clearly, environmental and social changes, as well as changed political priorities, will pave the way to include wider aspects in knowledge assessment practices, but the importance of paths previously trodden should not be under-estimated.

Thus, there is a need to include manifold understandings of the environment, involving different kinds of expertise (including social sciences), in the shaping of environmental problems. There is no universal expertise relevant for all kinds of environmental problems—but there is also no one specific expertise for a particular environmental problem. Additionally, in the dynamic configuration of environmental problems and environmental expertise, it is important to not only acknowledge the importance of perspectives other than restricted scientific ones but also provide space in which these other perspectives really matter.

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9

The Practice of Green Consumption

Emily Huddart Kennedy and Darcy Hauslik

Going Green

Calls to 'go green' are ubiquitous in contemporary societies: banners in grocery stores invite us to protect our health and the planet by shopping for organic products and we can purchase everything from cars to clothing that purportedly allow us to tread lightly on the earth without lowering our levels of consumption. Individuals are responding in large numbers to such calls: for example, organic food sales continue to grow in Europe (Halkier et al. 2016) and North America (Jaenicke and Carlson 2015) and hybrid and electric vehicle sales have risen in the United States (US), Europe, and Asia (Sushandoyo et al. 2016). The popularity of green consumption is also evinced by a recent survey reporting that nearly 65% of food shoppers in Toronto (Canada) agreed that shopping is a powerful force for change (Baumann et al. 2015). Academic literature offers us many ways to understand and evaluate the phenomenon of 'green

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consumption', defined here as the purchase of less environmentally-intensive goods and services in the routines of everyday life. However, the most widely-used theoretical approaches conceptualize green consumption from within the domain of voluntarism and it is this conceptual grounding that informs much environmental policy oriented toward social change. Voluntaristic explanations of social phenomena presume individuals have extensive power, or agency, when acting and that this individual decision-making is central to organizing the social world.

Green consumption is doubtless a worthwhile endeavour in the pursuit of sustainability. Indeed, Dietz et al. (2009) found that greenhouse gas (GHG) emissions in the US could be cut by 7.4% if households adopted environmentally friendly daily routines. However, evidence suggests that individual-level strategies are not an effective way to achieve a critical mass of green consumption. Voluntaristic explanations rely on models of individuals' socio-demographic characteristics and attitudes to predict behaviour, largely ignoring or downplaying the role of social context. Voluntaristic solutions follow suit, relying on information campaigns and moral suasion to encourage green consumption. In this chapter we describe two impacts of voluntaristic conceptualizations of green consumption: first, individuals are made responsible for complex, systemic issues related to sustainability, and second, individuals tend to respond to such 'responsibilization' by acting as consumers.

We argue that these two issues (individualization and consumer responses) limit the extent to which prescriptions from existing literature can inform effective environmental policy solutions. In response, we make a case for a more promising conceptualization of green consumption: the 'social practice approach'. Social practice theories are a more insightful lens through which to conceptualize green consumption because this approach takes into account how unsustainable practices originate not from the self-interest of individuals, but as the outcome of everyday structural arrangements, from internalized social norms to corporate and political structures. In the following pages, we begin by highlighting some of the shortcomings of green consumption as conceptualized within voluntaristic social theories. We then provide clarification on *practices*—how they are studied and how they differ from behaviours. After setting the stage with this definitional work, we draw on existing litera-

ture to summarize the shortcomings and advantages of green consumption as a behaviour and as a practice before concluding the chapter with recommendations for more effectively conceptualizing green consumption and accounting for its strengths and limitations.

Overall, our chapter makes the argument that at present, a prominent approach to greening consumption involves individualizing the responsibility to consume more sustainably. A contemporary reliance on individualistic approaches serves to leave unchallenged elite control over natural resources and to limit people's capacities to imagine engaging in sustainability beyond personal shopping choices. These limitations are reproduced when scholars operationalize green consumption as an individual choice, rather than a shared responsibility of citizens, the state, and capital. Practice theories provide a framework to critically reflect on the nexus of citizen, state, and capital influences on sustainability.

Questioning the Power of Green Consumption

A world where green consumption is the default option would likely be a significantly healthier and more ecologically sustainable place to live. Collectively, at the state and market level there are efforts to bring about widespread and accessible green consumption, for example, in product design and architecture (Braungart and McDonough 2002) or in developing alternative methods of measuring progress that account for more than the market value of goods and services produced (Anielski 2007; Hayden and Wilson 2016). More recently, many corporations have adopted sustainability thresholds under the mantle of corporate social responsibility (CSR) and governments in Europe and North America have initiated sustainable procurement policies for public institutions (Brammer and Walker 2011). Market-based instruments (e.g., carbon tax) and technological developments (e.g., solar-powered planes) also purport to advance sustainability. These interventions have had mixed success in advancing sustainability (i.e., limited progress of adopting market-based instruments and political resistance to replacing fossil-fuel based energy in many parts of the world). Policies aimed at greening consumption include procurement policies, labeling (e.g., Forest Stewardship

Council certified paper products, free-range eggs), and information-based and moralistic appeals for ecologically responsible consumption (e.g., the United Kingdom's 'Do Your Bit' campaign, Canada's One Tonne Challenge) (Hand et al. 2005). Meanwhile, optimistic prescriptions for individuals to 'go green,' without systemic transformations to the socio-technical contexts in which individuals make decisions and routines, dominate public interest messages (Shove 2010). As a result, there exists extensive investment in greening consumption through the actions of individuals (Soneryd and Uggla 2015; Warde 2017). While there are many criticisms associated with individualistic prescriptions for green consumption, we focus on a subset of these here. Debates over the merits and drawbacks of green consumption call attention to both the material significance of changing individual consumption patterns and the uncertain cultural impacts of asserting that individuals' power to change their social worlds for the better lies primarily in their choices in the marketplace.

The *first limitation* of generating green consumption through individual actions is material. Individuals take up very little 'ecological space' compared with institutions like the military or corporations in the fossil-fuel industry (Jorgenson and Clark 2012; Kennedy et al. 2014). Further, individuals may adopt green consumption practices (such as buying organic products and using a hybrid car) but their volume of consumption may still result in unsustainable levels of resource use and GHG emissions (Kennedy et al. 2015b). The key issue at stake here is whether encouraging individuals to participate in green consumption without exerting pressure on the state and corporate sector can amount to significant reductions in emissions and resource-use: available evidence suggests this is unlikely (Csutora 2012; Lorenzen 2014). When greening consumption becomes a personal responsibility, the act of buying green can obfuscate the disproportionate ecological impact that elite actors and institutions have (Freudenburg 2005). Masking the fact that wealthier individuals (Kennedy et al. 2014) and certain corporate sectors and entities (Greenberg 2017; Nowak et al. 2006) have larger impacts on the environment can lead to an inequitable division of responsibility to protect the environment and can unwittingly foster polluters' privileged access to natural sources and sinks (Freudenburg 2005).

A *second limitation* concerns the cultural impacts of green consumption. The importance of community-centered approaches as crucial for ensuring environmentally just outcomes of decision-making and planning is well documented (see Roberts, Pellow, and Mohai this volume). It is crucial to critically evaluate the role of individualization in relation to more traditional collective responses. To these ends, one important question is whether green consumption displaces, or 'crowds out', traditional political practices. Some scholars have suggested that the rise of consumer-focused solutions has influenced a decline in traditional political engagement such as voting, membership in civic associations, and participation in protests (Maniates 2001). For example, Szasz (2007) argues that in the US, a widespread response to concerns over water quality has been an increase in bottled water consumption rather than demands for greater regulation of polluters or investment in and monitoring of municipal water quality. He asserts that the feeling of security afforded by a consumer-based solution is both illusory (that we cannot fully protect our health given the systemic nature of ecology) and dangerous, as it reduces individual motivation to demand state-based solutions. Related literature on how we govern environmental protection finds that in the civic sphere, the consumer is seen as most influential actor and that across civic, state, and market spheres, individuals are expected to take on considerable responsibility for protecting the environment (Soneryd and Uggla 2015). In short, conceptualizing green consumption as an individual responsibility may constrain more creative and collective responses to environmental challenges.

In contrast to the somewhat pessimistic outlook on consumer responses as crowding out traditional engagement, other scholars complicate the idea that green consumption is actually individualistic. In this body of research, we are encouraged to notice that consumption-based responses often arise precisely because governments have retreated from the role of responding to ecological threats and thus, green consumption is a part of a larger collective political agenda. For instance, while remaining critical of the individualization of responsibility, MacKendrick's (2010) account of how mothers use product choices to protect their children from chemical exposure provides an example of how individuals use consumer choices when governments are not trusted to regulate corporations in the

public interest. These consumption-based acts, some argue, are therefore deeply political as they emerge from a desire to do one's part to protect or advance the common good (Micheletti 2003). There is empirical support for this assertion, documenting a positive association between green consumption and political engagement (Bauman et al. 2015; Micheletti and Stolle 2007; Stolle et al. 2005; Willis and Schor 2012). Green consumption does not necessarily *cause* traditional political engagement, but as Willis and Schor (2012) demonstrate in their surveys of US residents, those who shop for environmentally friendly products are also those most likely to contact elected representatives, donate money to projects or causes, and participate in other forms of traditional political activity.

A *third limitation* of individualistic approaches to greening consumption is methodological. The dominant approach to studying voluntaristic engagement with green consumption emphasizes the role that certain demographic characteristics play in predicting green consumption and the process by which pro-environmental attitudes influence pro-environmental actions such as buying green products. Regression models of green, or pro-environmental consumption patterns can typically explain up to 30% of variation in individual consumption by accounting for socio-demographic variables (e.g., income, education, age, gender, political orientation) and social psychological variables (e.g., values, attitudes, beliefs) (e.g., Kennedy et al. 2009; Schultz and Zelezny 1998). However, even these increasingly complex models leave 70% of variation in individual consumption unexplained. The limited utility of these models highlights one of the major shortcomings of the voluntaristic approach: individual consumers have limited agency in making consumption decisions. Even when consumers profess strong pro-environmental attitudes, their behaviours do not necessarily reflect these attitudes, a phenomenon commonly termed the 'value-action gap'.

In an attempt to better account for barriers and motivations to buying green, some scholars use firsthand accounts from green consumers to understand what factors people acknowledge as important in shaping their actions in the eco-friendly marketplace. What we learn from such accounts is that for many, the power to consume in an environmentally-friendly way is felt to be outside their control and responsibility. For example, to consume green products, these items need to be physically

accessible to the shopper, financially feasible, appeal to shoppers' tastes, and be straightforward enough to consume within the "time crunch" experienced by many individuals. Not surprisingly, most people are constrained by at least one of these factors (Kennedy 2011; Lorenzen 2012; Schoolman 2016). This is a key shortcoming of the voluntaristic approach—efforts to predict green consumption behaviours are subject to ever-more complicated models aimed at capturing all of these elements (e.g., Kollmuss and Agyeman 2002).

The three shortcomings described thus far can be clearly seen in the relatively recent and highly popular 'nudge' strategy articulated by Thaler and Sunstein (2008). Nudging is used to change the 'choice architecture' people use to make decisions in order to encourage them to adopt desirable behaviours (Lehner et al. 2016). A well-known environmental example is the use of green footsteps leading to a garbage can to 'nudge' litter into a trashcan. While nudging sidesteps the need to develop green attitudes, it nonetheless suffers from the same limitations described above. *Materially*, individual actions still, as Evans (2011, p. 115) explains, "amount to little more than tinkering around the edges" by ignoring disproportionate distributions of power and the fact that "prevailing standards of appropriate conduct within social practices are not conducive to the pursuit of sustainable consumption" (Evans 2011, pp. 114–115). *Culturally*, nudging may be a way to engage people with little awareness of sustainability to act in a 'green' way but it ignores an important consensus that engaging individuals in social change will only be effective when the dominant socio-technical landscape supports sustainable consumption. *Methodologically*, nudges are unlikely to lead to long-term changes in routines, as evidenced by Barr's (2015) critique of efforts to 'nudge' people to reduce use of the personal automobile. These nudges have to contend with vested interests (e.g., fossil fuel industries), cultural norms (e.g., car as freedom), and routinized patterns of behaviour (e.g., driving to work as part of a typical day). Unless a nudge is consistent with these more powerful dynamics, it will be lost in a sea of conflicting cues and messages (Barr 2016).

What is clear from this review is that the dominant conceptualization of green consumption envisions individualizing responsibility through shopping choices and that this individualization enables privileged access

to resources for elite individuals and powerful corporate entities. Further, as individuals focus on their own (relatively minimal) impact, the actions of these elite and powerful actors are shielded from public critique and interrogation. In light of these shortcomings, a growing number of scholars are looking to social practice theories as a more effective way to conceptualize green consumption.

Social Practice Theories

Social practice theories have a significant place in sociological theory but have only relatively recently been applied to the study of green consumption. The impetus for their application to sustainable consumption is connected to the three limitations described above and the policy implications of those limitations (Shove 2003, 2010). As defined by Kennedy et al. (2015a, p. 7) practice theories are those "theories that seek to explicate the relationship between agency and structure by taking everyday practices into account." Practice theories emphasize a dialectical, rather than oppositional, relationship between structure and agency. In other words, rather than accepting either the premise that social action unfolds in response to arrangements of economic and political power and social norms, *or* that individuals effortlessly move about their social worlds according to their own values and goals, practice theories assume that individual characteristics are in constant dialogue with the structural arrangements around them (Bourdieu 1977; Giddens 1984; Ortner 2006). While there is no single accepted practice approach, this family of theories is unique in this treatment of structure and agency as well as in its ensuing attention to 'practices' (such as cooking, researching and driving) as the most meaningful unit of analysis for understanding the social world. For a practice theorist, practices (not individuals or structures) are the 'site of the social' (Reckwitz 2002; Schatzki 1996). Though a thorough account of this heterogeneous branch of sociological theory is beyond the remit of this chapter, we hope a brief summary will inform a useful evaluation of green consumption and advance the academic study of this phenomenon.

Despite some differing points of emphasis in defining the term 'practice', the commonalities are clear: practices are *patterns of behaviour*[1] (Reckwitz 2002) rather than discrete acts adopted by individuals (as operationalized within voluntaristic theories). The roots in Bourdieu (1977) and Giddens (1984) are clear in the emphasis placed on the role of habits and routines as essential for understanding practices. The key role that reproduction of practices plays in making particular ways of acting the only imagined mode of competently engaging in daily life is a clear application of Giddens' (1984) structuration theory (Warde 2005). Practices are both intimately related to the individuals who carry them but also transcend individuals; this is not a theory of individual actors but of social routines carried out by members of society. In this light, individuals are relevant in empirical inquiry only as 'carriers of practices'. Reckwitz (2002, p. 249) illustrates this point poignantly by relating even the seemingly most individualized elements of a practice—knowledge and desires—back to the patterned nature of practices: "These conventionalized 'mental' activities of understanding, knowing how and desiring are necessary elements and qualities of a practice in which the single individual participates, not qualities of the individual." That is, what feels desirable to someone is a function of their past habits, cultural values, and socially-embedded meanings (Bourdieu 1984; Lizardo 2016). For example, in the context of food, recent interview-based research conducted with low and high-income Canadian families found that low-income households have a taste for abundance (buffets; quantity over quality) while high-income households have a taste for authenticity ('real' ethnic food; quality over quantity) (Beagan et al. 2016). While these desires feel natural, and result in very distinct consumption practices, there is a social logic at work here.

Although practices tend to remain fairly stable over time, and are inscribed in routines and habits as described above, practices are also susceptible to change. Understanding the drivers of change (through a social practice lens) is particularly important in studies of sustainable consumption, given the topic's normative aim of undoing unsustainable patterns in favour of more sustainable ways of living. Accounting for change, social practice theorists aim to understand the factors that lead to the recruitment to new practices (Shove and Pantzar 2005), that is, the

way that a practice can draw in individuals. In an attempt to more fruitfully understand how to promote changes toward sustainable practices, scholars have broken down the constituent elements of a practice into *meanings, materials and skills,* demonstrating that recognizable practices change when any of these elements change (Shove et al. 2012). For example, the practice of keeping in touch with people changed with the introduction of smart phones (a material) as people could now communicate with others at virtually any moment. This required new skills in using new handheld devices and learning new rules of etiquette, language and so on. The evolution of one or more element—and subsequently the way all elements hang together—can change the wider practice. Giddens (1984) allows for a specific process of change in his structuration theory. While most actors are participating in practices without giving them much thought or reflecting critically—guided unconsciously or by a 'practical' consciousness—there is room for ruptures to bring taken-for-granted practices into the realm of 'discursive' consciousness wherein everyday sayings and doings will be evaluated critically and potentially reformed or edited. Next, we look more closely at how social practice theories reorient our conceptualization of green consumption.

Understanding Consumption Through Social Practice Theories

Turning more specifically to social practice theories of consumption patterns, we note a general consensus that consumption (green or otherwise) occurs almost subconsciously as part of the routine performance of larger practices rather than reflecting the actualization or rejection of environmental values, as presumed in voluntaristic theories. In other words, practice scholars believe that individuals do not set out to consume resources or emit GHGs, but that these consumptive effects are a result of competently moving throughout one's daily life. For example, one's car emits fossil fuels as we drive, and the act of driving is a moment in many practices, including working, leisure, travel, and shopping. This is a particularly useful insight when considering some of the most environmentally significant resources that are consumed, such as gas in automobiles, or water and energy in

households. For instance, while most surveys of ecological behaviours ask about how often people reduce energy or water use for environmental reasons (e.g., US General Social Survey), few people move throughout their daily routines with the intention of using up energy and water resources. These are consumed as part of the quotidian effort of eating, keeping comfortable, staying clean, working, and so on. This idea that we consume vast resources without consciously trying to display status by using up resources is what Shove and Warde (2002) refer to as 'inconspicuous consumption'.

In keeping with the practice tradition of focusing on routinized, habitual activity, much literature in the practice-based study of green consumption focuses on the material impact of many mundane aspects of consumption. For example, studies of water consumption examine gardening (Chappells et al. 2011) and showering (Hand et al. 2005). Studies of energy use explore socially acceptable patterns of home heating (Shove 2003) as this relates to evolving norms of comfort. These studies conceive of consumption as taking place as part of a fundamentally social constellation of practices that come to feel normal. For example, the water-intensive practice of daily showering (Hand et al. 2005) illustrates the role of technological advancements in plumbing that made possible multiple bathrooms in each home, the time-crunch created by arrangements of work that position the shower as a convenient way to stay clean, and the norms of cleanliness that associate clean bodies with 'good' people. Daily showering was not just resource-intensive in the sense of water (and energy to heat that water) but also in the footprints of houses. Quitzau and Røpke (2008) looked historically at how the need for daily showers created a bottleneck in bathrooms, especially if families had teenagers and working parents all of whom needed to leave at the same time, and thus houses were constructed with more bathrooms to accommodate these evolving norms and schedules. Taken together, daily showers have become the norm in many places, and, interestingly, baths are now redefined as the epitome of comfort and luxury; an extravagant complement to daily showering. In the case of water and energy use, it is clear that these resources are used as part of practices. In the social practice approach, the question of how to green these practices is reframed from a standard individualist or structuralist approach that might ask: "how do we get people to use less water?" and becomes, for the practice theorist: "what is water used for?"

It should now be clear that in adopting practice theories, consumption is unseated as the act of primary concern and that dominant voluntaristic conceptualizations of green consumption are fundamentally flawed. While more traditional sociological and anthropological inquiry looks at consumption as a means of communication and status display, within practice theories, consumption is "not itself a practice but is, rather, a moment in almost every practice" (Warde 2005, p. 137). The individual act of consumption and the objects consumed are no longer the primary units of analysis; rather, the practices that are facilitated by consumption become important (Warde 2017). For practice theorists, the act of consumption could be studied as the 'practice of shopping,' but the emphasis here would be on skills, materials, and meanings of shopping as a distinctly routinized social activity. "Shopping" could be studied as a practice, but for most practice theorists the more mundane side of shopping (e.g., buying groceries for dinner) are interesting as embedded in larger practices (e.g., cooking, caregiving). As for the shift away from studying objects of consumption as communicative and symbolic, the logic here is obvious in the context of 'everyday' consumption where 'activities generate wants' rather than the other way around: children do not pick which sports to engage in based on their attraction to the gear involved, the gear merely facilitates the activity. Though sports gear itself is often imbued with symbolic values and status, for practice theorists this discussion would be couched in the larger context of sports as practices rather than gear as symbolic.

The social practice approach resolves many of the limitations of the voluntaristic lens by reconceptualising green consumption as a socially-embedded practice rather than an individual behavioural choice. In the practice approach, scholars study green consumption by attending to the dynamics of the meanings, materials and skills surrounding daily practices like working, eating, and enjoying leisure time (e.g., Spaargaren 2013). Highlighting the elements of a practice (materials, meanings and skills) powerfully showcases the limitations of voluntaristic theories of green consumers and the resultant individualistic policy approaches to greening consumption and overcoming the value-action gap. For example, while a newly developed value (meaning) for sustainability could prompt a resolution to drive less, the daily routine of driving is strongly shaped by material elements—roadways without bicycle lanes, infrequent

public transit, long distances between home, schools, and workplaces; practices are also influenced by skills (learning the transit schedules, timing one's commute to arrive on time, cycling in inclement weather conditions). Finally, these newfound meanings and skills still interact with long-standing norms that may be contradictory to the value for sustainability (e.g., that professionalism entails arriving at work in certain attire, not flustered or sweaty, that status is enhanced by a vehicle, and so on). Running campaigns aimed to encourage people to adopt cycling as an act of environmentalism misses the myriad obstacles limiting the long-term and widespread adoption of such practices. Rau (this volume) underscores that a practice approach can not only result in more sustainable outcomes, but also that understanding these complex interactions as rooted in culturally relevant histories can more directly lead to socially just and community-minded outcomes. Policy informed by a practice lens opens novel avenues of interventions that more effectively disrupt the political status quo of individualizing responsibility by looking to practices as complex interactions between individual citizens, the state, and socio-technical structures.

Reconceptualizing Green Consumption

To date, most green consumption scholars use voluntaristic conceptualizations that result in empirical indicators of individual behavioural acts (e.g., how often a person buys organic food) and fail to account for the role of power in shaping societal consumption patterns. For example, power can be evidenced in the case of organic food purchasing by dimensions such as the cultural capital required to develop a taste for organic (Baumann et al. 2015; Guthman 2008), the existence of food deserts (areas lacking access to nutritious foods) (Fonte 2008), and the cost premium of organic foods. We believe that reconceptualizing green consumption as a social *practice* rather than an individual *behaviour* is an important first step toward an effective environmental politics for three reasons. First, individual actions in the marketplace do little to threaten the power imbalances that allow certain actors and institutions relatively unfettered access to consume resources and harm the natural and social environments. Second, individual-level solutions can limit the

efficacy of civic engagement in sustainability when these approaches dominate how people collectively imagine engaging in civic life. And finally, voluntaristic conceptualizations of green consumption reinforce the individualization of responsibility to protect the environment—expecting individuals to make changes to their daily lives while state and corporate actors act to reproduce the status quo.

Reconceptualizing green consumption as a social practice involves two key analytic shifts away from a voluntaristic conceptualization. First, understanding green consumption as a social practice requires attending to the meanings, materials, and skills shaping how much we consume in everyday life. This requires accounting for the socio-technical landscape influencing green consumption, which necessitates considering the role of state and corporate practices. In this way, scholars can consider how state and corporate policies can either make consumption more sustainable or individualize responsibility to protect the environment obfuscating the role that more powerful entities (e.g., the military, the fossil-fuel industry) play in harming the environment (Freudenburg 2006; Soneryd and Uggla 2015). Second, a critical social practices lens can be applied to consider the power dynamics at work in the individualization of responsibility to protect the environment. Who wins and who loses when the cultural norm is to assume environmental issues stem from the aggregate activities of greedy and selfish individuals? Who wins and who loses when buying expensive green products is taken as evidence of moral standing? Material evidence suggests that we are not equally responsible for environmental issues, and that institutions and wealthier households bear much more responsibility than the average individual (Kennedy et al. 2014; Maniates 2001). If so, then a more enduring environmental reform, resulting from changing practices might involve efforts to move green consumption out of the private sphere and into the public sphere, where policies and politics are shaped (Kennedy and Bateman 2015).

Reconceptualizing green consumption as a social practice thus opens up new questions for future research, action, and pedagogy. Moving away from the voluntaristic question, 'what factors predict frequency of adoption of green consumption behaviours?', we are now compelled to ask, which companies, institutions, and individuals have the greatest impact on using up natural resources? How do those entities justify their over-

consumption? What socio-technical arrangements are associated with sustainable levels of resource use? What practices encourage people to get involved in environmental protection through avenues beyond consuming differently? And, how is the individualization of environmental responsibility made to feel normal for actors in civic, state, and corporate spheres? Until green consumption is automatic, that is, embedded in the daily practices of all actors in society, the complexity of developing new meanings, materials and skills will continue to prevent truly sustainable consumption. It is for these reasons that targeting individuals through simplistic information campaigns is ineffective—these messages are blind to the role that power, habit and routine play in shaping social practices and downplay the myriad structural barriers to green consumption.

As a final point, we caution against a purely reactionary response to the flaws in green consumption models that adopt a voluntaristic worldview. To swing the pendulum in the other direction and claim that individuals have no role in sustainable transitions is also problematic on several fronts. Overemphasizing structure while obscuring agency is, first of all, deeply problematic from a practice perspective that views both structure and agency as intrinsically and dialectically linked, but is also disheartening and disempowering for individuals and at odds with evidence that individuals and small groups can catalyze significant social and ecological reforms (Goldfarb 2006).

Concluding Remarks

In this chapter we have outlined the promises and limitations of green consumption as a strategy for achieving sustainability; we have described dominant (voluntaristic) approaches to studying and promoting green consumption; we have summarized social practice theories; and we have argued that social practice theories improve upon voluntaristic conceptualizations of green consumption, in this way offering an alternate path to individualistic appeals to 'go green'. In short, we argued that social practice theories are a more powerful way forward because there is room in this approach to consider the limitations of individual action and the cultural impact of individualizing responsibility to protect the environment, and because it is more effective at generating insights into how green consump-

tion might become more systemic. This final point in particular raises the question of what state and corporate actors might do to reorient the status quo to foster green consumption. Through the practice lens we see how individualizing the responsibility to protect the environment constrains the richness of civic environmentalism and leaves unhindered the existing institutional arrangements that result in unsustainable levels of GHG emissions and other harmful environmental impacts.

Conceptualizing environmental reform as predicated on individual action is stymieing political discourse by limiting creative responses to environmental challenges and preserving problematic power relations. It is time to stop calling on individuals to 'go green' without investing in significant reforms to our socio-technical systems and economic policies. Individual actions appear to dominate our collective imaginaries of how to advance socio-ecological change, and can result in shifting attention away from those actors and institutions most egregiously using up and polluting our shared natural resources. In reconceptualizing environmentally relevant social action using the social practices approach, we can better understand the impact that an emphasis on individual-level consumption has on shaping the politics of the environment and the constellation of elements that might inform a more robust and collective environmentalism.

Notes

1. Behaviour as a standalone concept is usually avoided in work employing practice theories, however, in this context we use the phrase 'patterns of behaviour' to visualize the bundles of elements comprising practices.

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10

Minding the Mundane: Everyday Practices as Central Pillar of Sustainability Thinking and Research

Henrike Rau

Introduction

Global efforts to initiate sustainability transitions that reconcile economic development with the twin goals of social justice and environmental integrity have had limited success to date (Lorek and Fuchs 2013; Kropp 2015; Lorek and Spangenberg 2017). Greenhouse gases continue to rise globally, despite international efforts to halt their generation and emission (Allen et al. 2014). This is matched by rising rates of consumption of key resources such as water and energy (OECD 2013; IEA 2014). The 'Brundtland vision' for a new type of development that meets the needs of the current generation without undermining the ability of future generations to meet their needs has hit both anticipated and unprecedented obstacles since its publication thirty years ago (WCED 1987).

Debates also continue to rage about the feasibility of achieving universal human well-being at moderate energy and carbon levels, for example

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through a more equal global distribution of natural resources (Steinberger and Roberts 2010; Wilkinson and Pickett 2009; Barry 2012). For example, Wilkinson and Pickett's seminal work *The Spirit Level: Why More Equal Societies Almost Always Do Better* treats as closely interconnected the prevalence of income inequality, health and social issues and environmental impacts. Arguments also abound against the systematic externalisation of social and environmental costs of (over)development (Lessenich 2016; Brand and Wissen 2017).

What exactly is hampering efforts towards greater sustainability? Undoubtedly, prevailing social, economic and political conditions and hard-to-change systems of production and consumption are central to the puzzling persistence of 'actually existing unsustainability' (Barry 2012). However, this chapter will reveal how the inherently paradoxical nature of how sustainability is currently thought about, debated, and measured plays an equally significant role. Although the idea of sustainability is intended to offer a positive vision for a flourishing society that encourages people to take action, skepticism and inaction regarding the concept itself and its measurement have persisted. This has coincided with a significant conceptual narrowing of the sustainability agenda to politically palatable and quantifiable goals, most of them in the area of climate change adaptation and mitigation, and related sustainability assessment (SA) tools. This chapter challenges currently dominant forms of 'weak' sustainability thinking that treat as more or less easily reconcilable economic growth, human flourishing and environmental integrity and that ignore many people's experiences of a highly unequal distribution of social and environmental benefits and risks associated with projects and initiatives labelled as 'sustainable' (Barry 2012; Rau et al. 2014; Roberts et al. in this volume).

This chapter also questions the dominance of technocentric and managerial approaches to sustainability. It is argued that framing the environment as a problem to be managed by technical means has denuded the public's imagination in relation to sustainability, and has fueled public disengagement from sustainability debates, especially by those with limited technical expertise (Welzer 2013; Fox and Rau 2016). For example, current debates in Germany concerning the 'energy turn' (*Energiewende*), a suite of political, economic and technical measures intended to replace

non-renewable energy sources with renewable ones, illustrate this. Here, a heavy emphasis on economic and technical aspects (e.g. incentives for homeowners to energy-retrofit their property, R&D investment in heating and cooling technologies, expansion of wind and solar sectors) contrasts with an almost complete absence from public debate of related social issues (e.g. rent increases following energy retrofitting) or opportunities for changing energy-intensive everyday practices (e.g. driving, space and water heating). The proliferation of sustainability indicators that record public support for ecologically less harmful forms of consumption (e.g. of energy-efficient light bulbs, 'green' cars, insulation), as opposed to a radical reduction in consumption, mirrors this trend towards 'light green' managerial approaches (Rau et al. 2014).

Many technocentric and managerial views of sustainability also promote forms of SA that concentrate solely on directly measurable and quantifiable aspects of economic development and environmental degradation (e.g. CO_2 emissions reductions). An emphasis on goals such as measurable and numerically expressible reductions in greenhouse gas emissions by 2020 or 2050 or a halving of energy use, viewed by many as integral to successful sustainability transitions, exemplifies this. This mirrors Meadows' (1998, 4) observation that 'indicators arise from values (we measure what we care about), and they create values (we care about what we measure)'. Consequently, less tangible and difficult-to-measure impacts of sustainability policies and projects remain invisible, including long-term effects (Rau and Edmondson 2013; Rau 2015) and potentially negative social consequences (e.g. Dempsey et al. 2009; Rau and Fahy 2013, see also Boström (2012) on the missing social dimension in many sustainability debates). Perhaps more importantly, the persistent marginalisation in sustainability debates and assessment of non-technical, non-quantifiable sustainability solutions such as the transformation of people's everyday practices have greatly reduced the mobilising momentum of the sustainability agenda.

As a way of responding to these conceptual and methodological contradictions, this chapter proposes a redefinition of sustainability as a suite of shared socio-material practices that serve the resource-conscious (re)production of social life and a fairer distribution of the benefits of development. This redefinition is intended to encourage those who research sustainability, including environmental social scientists, to direct their attention towards

manifestations of the mundane that occur through the recurrent realisation of everyday practices by large numbers of people or 'practitioners', and their social and environmental consequences (Kammen and Dove 1996; see also Huddart Kennedy and Hauslik in this volume). This practice-focused perspective treats the local and the mundane as central to global efforts towards sustainability thinking and action.

The remainder of this chapter is divided into five sections. Second section reviews current trends in sustainability research and assessment. Recognising the growing popularity of practice theory, the chapter subsequently presents arguments for a practice-centred approach to sustainability (third section). Fourth section reflects on the benefits and drawbacks of a practice-centred approach to sustainability and its potential linkages with already established challenges to pro-growth thinking such as the degrowth perspective. The chapter finishes with a set of conclusions (final section).

Sustainability Theory and Assessment: Trends and Challenges

Debates continue about what counts as 'sustainable' and how to design tools for measuring (lack of) progress regarding specific sustainability goals (e.g. Sachs 1997; Krueger and Gibbs 2007; Khoo 2013; Rau and Fahy 2013). These regularly reveal the often paradoxical nature of most conventional consensus-oriented approaches to sustainability. For example, the often-cited Brundtland definition (WCED 1987) advocates a needs-based, intergenerational perspective that implicitly endorses a linear growth logic that equates 'development' with continuous improvements in (material) standards of living. Moreover, it adopts a 'three pillar' perspective whereby economic, social and environmental concerns are seen as reconcilable (as opposed to presenting conflicting and incompatible interests). The 'Brundtland view' thus often translates into 'light green' ideas, public discourses and policies that view democratic consumer capi-

talism and ecological sustainability as mutually compatible (cf. Lorek and Fuchs 2013; Rau et al. 2014).

This said, a broad spectrum of proposals exists for amending this consensus-oriented view of sustainability. These include human development and capabilities approaches (Khoo 2013; Nussbaum 2015), 'strong' sustainability thinking that grapples with the idea of integrating social, ecological and economic interests (Ott 2009; Lorek and Fuchs 2013) and efforts to incorporate ethical concerns (Vogt 2013; Fredericks 2014; Hannis 2015), emotions (Norgaard 2011; Davidson 2017) or a nuanced concept of power (Partzsch 2015). As early as 1997, Wolfgang Sachs critiques the oxymoronic nature of the term 'sustainable development'. In particular, he cautions against overly optimistic, consensus-oriented views that ignore the inherent conflict potential of sustainability and that lend themselves to cooption by advocates of a business-as-usual development agenda (Sachs 1997). Here, he identifies a dominant eco-modernist competition perspective that promotes the 'greening' of economic processes without fundamentally altering the capitalist system and its competition logic. This starkly contrasts with two alternative perspectives, the 'astronauts' perspective' that adopts a planetary view of sustainable development and the 'home perspective' that focuses on local sustainability solutions. Interestingly, the obvious conceptual and practical tensions between these three perspectives are rarely discussed even today.

Wilkinson and Pickett's (2009) aforementioned study also shifts attention away from a sole focus on economic growth and towards the frugal use and fair distribution of existing human and material resources. These authors argue that removing income inequality rather than indiscriminately increasing income should be the main focus of sustainable development efforts, eliminating key social and health problems in the process. Wilkinson and Pickett's perspective thus clearly departs from development approaches rooted in classical economics that uncritically assume economic growth and rising income to automatically cure many societal ills. Importantly, their work explicitly draws attention to the complex relationship between income inequality and environmental degradation, a core sustainability issue. As will be shown later in this chapter, this relationship can be fruitfully analysed through the lens of everyday practices and the wider societal conditions that shape them (third section).

Similarly, Ehrenfeld (2004) criticises business-as-usual approaches to sustainability, including more narrow efforts towards eco-efficiency, because for him these simply serve to slow down the pace of unsustainability. Calling for a paradigm shift in how sustainability is conceptualized and measured, he promotes the pursuit of 'true sustainability' that is, the 'possibility that human and other forms of life will flourish on the Earth forever' (Ehrenfeld 2004: 4). People need to be able to imagine what a flourishing society might look like and to take action to realise these ideas. 'Unsustainability is measurable; it can be managed and incrementally reduced. But sustainability—the possibility of flourishing in the future—is aspirational' (ibid.).

Yet others have advocated a radically different vision for a flourishing society that recognizes the inherent conflict potential of sustainability and that advocates radical social action, not quick technological fixes. For example, Campbell's (1996) conflict model of sustainability addresses potentially insoluble tensions between economic growth, the desire for equity and need to protect the environment. Others focus explicitly on efforts towards redistribution (of wealth, work, time, or social and ecological benefits) that require little or no economic growth (Douthwaite 1993; Parris and Kates 2003; Latouche 2009; Martinez-Alier et al. 2010; Schor 2010; D'Alisa et al. 2014; O'Neill 2014, 2015). Some steady-state and degrowth approaches also promote forms of exnovation, that is, the deliberate disassembling or discontinuation of existing unsustainable infrastructure, systems of production and consumption, or everyday practices (Kropp 2015).

Key Trends in Sustainability Assessment (SA)

Surprisingly, the question how particular sustainability concepts shape SA processes and tools has received limited attention in research and practice to date.'[I]n most cases the development of indicators has started while there are still arguments over what constitutes sustainable development' (Singh et al. 2009: 191). This has produced a large body of 'disconnected' empirical work that combines assessment methods based on potentially incompatible conceptual foundations (Rau and Fahy 2013).

To be clear, the purpose of this chapter is not to dismiss the many diverse and increasingly sophisticated efforts in the field of SA (for an overview see Gibson et al. 2005; Morrison-Saunders et al. 2015). Recently introduced indicators of (sustainable) human development such as the Human Development Index (HDI) or the Happy Planet Index (HPI) constitute promising efforts by social scientists to broaden debates about (un)sustainable development and economic growth as exclusive measure of human progress. Nevertheless, increasing diversification of sustainability indices hampers systematic comparisons across time and space. This is further exacerbated by a lack of continuity in measurement that results from large policy-making institutions abandoning old and adopting new SA tools because of financial constraints, changes in the data landscape, or successful lobbying by those who have developed new indicators.

The issue of time also remains underrepresented. In fact, the short-term or 'snapshot' nature of much conventional SA cannot adequately capture cause-effect-relationships within complex social-ecological systems that evolve over long periods of time (Rau and Edmondson 2013; Rau 2015; Lockie and Wong in this volume). For example, empirically grounded knowledge about rebound effects, that is, medium- and long-term increases in consumption that cancel out some or all efficiency gains and that may transgress sectoral boundaries (e.g. savings made through a reduction in domestic energy use being spent on a long-distance holiday) remains at best patchy.

Regarding mainstream SA efforts to date, at least seven key trends can be identified. First, assumptions about the nature of human behavior that underpin these assessment efforts have often over-emphasised the role of cognitive efforts and individuals' capacity for rational decision-making, largely ignoring structural influences and emotional aspects in the process.[1] Similarly, empirical investigations of individuals' attitudes, behaviour and choices that pay limited attention to their dependence on prevailing material, social and political conditions continue to dominate. For example, willingness-to-pay experiments that aim to capture the (monetary) value people attach to particular environmental public goods (e.g. the ocean, their local park) enjoy considerable popularity in environmental economics and psychology; however, it remains unclear what it is exactly that these experiments measure (see Yearley in this volume). Surprisingly few efforts exist to systematically examine how particular

standpoints regarding the nature of human behaviour and its measurement shape sustainability research, with significant consequences for both intra- and interdisciplinary collaborations (Rau and Fahy 2013; Pahl-Wostl et al. 2013; Byrne and Mullally 2016).

Second, there is a proliferation of sustainability indexes that compete for funding and public attention (cf. Parris and Kates 2003). For example, in 2015 the *Compendium of Sustainable Development Indicator Initiatives* (CSDII) listed 895 entries from around the world.[2] These range from ecological footprinting tools that capture specific material impacts of individual products or complex production-distribution-consumption chains to local, national and global sustainable development indicators. Similarly, a plethora of sustainability indicators is used across the European Union (EU), making comparisons rather difficult. For example, Ruddy and Hilty (2008: 91) record five main SA frameworks that vary considerably in both focus and level of application. Similarly, the proliferation of sustainability indicators that target different levels of social organization (e.g. local communities, nation-states, supranational regions) poses considerable challenges concerning comparability (Ness et al. 2007; Singh et al. 2009).

Third, a clear tendency exists towards quantification and the use of numeric sustainability indicators. For example, most sustainability indicators used by the EU, the United Nations (UN), the World Bank and the Organisation for Economic Co-operation and Development (OECD) are large-scale, quantitative and focused on the nation-state as primary unit of analysis, although the latter may be complemented by a focus on global trends. In contrast, social and environmental data collected at subnational levels feature less frequently. This is regrettable given their importance for understanding social and political action, including people's motivations for acting more sustainably within their community (Edmondson 1997; Edmondson and Rau 2008). Moreover, the power of qualitative work remains under-appreciated, despite widespread recognition that hard-to-measure qualitative aspects such as wellbeing, quality of life, or attachment to place are central to sustainability.

Fourth, there is a prioritization of environmental information, at the expense of social and cultural data (cf. Rau and Fahy 2013; Fredericks 2014). As Gaube et al. (2013) observe, the parallel development of

Material Flow Analysis (MFA), Human Appropriation of Net Primary Production (HANPP) and the Ecological Footprint (EF) has significantly advanced environmental SA. However, these three indices inadequately capture important social, cultural and political dimensions of sustainability:

> […] the indicators presented are biased towards understanding the biophysical aspects of society-nature interactions. […] Attempts to understand and measure levels of sustainability thus have to move beyond mere ecological considerations to include social considerations too. (Gaube et al. 2013: 128)

Similarly, efforts to complement more ecologically focused Life Cycle Analyses (LCA) of products, services, particular technologies or entire systems with an assessment of their social impacts (Social Life Cycle Analysis or SLCA) remain in their infancy (Jørgensen 2013). Consequently, important societal processes that influence the emergence of (un)sustainable environment-society relations remain invisible.

At the same time, many social scientists hesitate to systematically engage with the material aspects of human behaviour. For example, social-scientific inquiries into the resource implications of different time use patterns remain scarce (cf. Rau 2015 for an overview). Given the continued prominence of certain historical efforts in sociology and cognate disciplines to identify both material and socio-economic aspects of work and leisure (e.g. Veblen 1899), this seems rather surprising. Similarly, many conventional development indicators, most notably Gross Domestic Product (GDP), have ignored environmental problems arising from increased economic activity (as well as ignoring pressing social issues such as rising income inequality) (Costanza et al. 2009; Khoo 2013).

Fifth, it is possible to observe a narrowing of how environmental sustainability is defined and assessed, having become equated more or less exclusively with GHG emissions and climate change. This has led to some serious omissions, for example the lack of attention to toxicity issues in many environmental assessment tools (Gaube et al. 2013). For example, the Ecological Footprint, one of the most prominent environmental

SA tools, cannot account for pollution through toxic waste, which seems particularly problematic given that many environmental conflicts and related justice movements around the world have revolved around the release of toxins into the environment.

Sixth, many SA tools either implicitly or explicitly embrace a pro-growth perspective that views sustainable development as contingent upon the expansion of current economic activity—but without the negative environmental impacts. For example, 55 out of 895 entries in the aforementioned CSDII include the word 'growth' in their title or indicator description.[3] Similarly, per capita GDP continues to be used as a key indicator of human progress and wellbeing across many SA tools such as the UN's HDI or the EU's Sustainable Development Indicators (SDI). This is problematic for at least three reasons. First, GDP was initially conceptualized as a measure of economic activity—not an indicator of human wellbeing (O'Neill 2014). Secondly, according to Costanza et al. (2009), 'GDP measurement encourages the depletion of natural resources faster than they can renew themselves' (p. 9), thereby undermining a core aim of sustainable development. Perhaps most importantly, the current use of GDP as a linear measure of progress completely ignores the existence of thresholds whereby quality of life and wellbeing only increase up to a point as GDP increases (Costanza et al. 2009; Wilkinson and Picket 2009).

Last in the list, the increasing 'scientisation' of SA appears to curb the involvement of ordinary citizens in these measurement efforts. Significant gaps have emerged between the academic community, on the one hand, and sustainable development advocates, practitioners and communities on the other (cf. Pahl-Wostl et al. 2013; Fahy and Rau 2013; Lidskog and Sundqvist in this volume). In fact, the application of many conventional sustainability indicators such as the EU's SDI requires extensive scientific knowledge that only a small part of the population in most countries possesses. Some have gone so far to suggest that SA has developed into an activity that is reserved exclusively for those who have sufficient political and cultural capital and educational credentials to secure funding and access to necessary data (e.g. McCool and Stankey 2004). Moreover, the proliferation of sustainability indexes that require extensive data input and expertise in handling and analyzing large-scale data makes it difficult

for non-specialists to understand and interpret their results (e.g. Ness et al. 2007; Ruddy and Hilty 2008; Fredericks 2014). This further reduces opportunities for active participation by citizens, communities and many smaller NGOs in the development and independent use of SA tools.

A related topic is the need for balancing complexity and simplification. According to Fredericks (2014: 64),

> […] technical experts [*in sustainability assessment*] hesitate to endorse the most manageable indexes because they know that many nuances of the data and their relationships are lost in such simplifications. On the other hand, policy-makers often know that they need technical guidance and would prefer clear, definitive answers: the overall air quality is getting better (or worse) (Ott 1978: 6). Consequently, indicator theorists will need to balance the competing impulses for manageability and comprehensiveness […].

A growing emphasis since the 1990s on 'evidence-based policy', which emerged as part of the shift from top-down, state-led government to multi-level governance systems that involve diverse actors, revealed these tensions between complexity and simplification. Overall, balancing technically sophisticated SA processes favored by scientific experts with policy-makers', NGOs' and individual sustainability advocates' desire for comprehensible and easily communicable results remains a key challenge.

This said, commendable efforts have been made to close this gap, with academic and non-academic sustainability advocates trying to link their assessment work to the concerns of communities affected by serious threats to their livelihoods and environments (see also Fischer's chapter in this volume). For example, citizen science initiatives (CSI) have emerged worldwide that create awareness of key sustainability issues such as biodiversity loss by involving the public in the collection and analysis of environmental data. Long-standing ornithological CSI such as the annual Christmas Bird Count organised by the National Audubon Society in the US since 1899 exemplify this.

What can be learned from the observations presented in this section? It seems plausible to argue that a practice-centred view of developmental processes, especially those that happen locally and that directly affect people's daily life, could potentially reinvigorate efforts towards sustain-

ability. A focus on everyday practices might also go some way towards addressing the phenomenon of 'socially organised denial' (Norgaard 2011) that prevents collective action towards sustainability. Furthermore, qualitative and quantitative assessment tools that explicitly focus on everyday practices could provide a real alternative to current forms of SA. Here, participatory, inclusive and accessible ways of measuring the presence or otherwise of particular sustainability practices might offer a new direction for SA.

Minding the Mundane: Arguments for a Practice-Centred View of Sustainability

A growing emphasis in social-scientific sustainability research on understanding practices has brought into sharp focus people's day-to-day efforts to establish and maintain shared routines as a way of creating trusted pathways through everyday life and sustaining communities into the future (Shove et al. 2012; Huddart Kennedy and Hauslik in this volume). The implications of this 'practice turn' for social-scientific sustainability research are manifold. Conceptually, an explicit emphasis on everyday practices can help to reinvigorate debates within both academia and civil society about what a more sustainable society might look like and how to achieve it. By acknowledging people's capacities to creatively solve problems in everyday life, for example by combining established routine practices to form new ones, a practice-centred perspective is uniquely suited to advance a view of human agency as socio-materially embedded. This might encourage those engaged in these practices to reconnect with the physical environment that they inhabit and use, at least to some degree, thereby reversing a long-standing trend in most modern societies of people disconnecting from the environment (Shove et al. 2012; Huddart Kennedy and Hauslik in this volume). Moreover, choosing practices as socio-material units of analysis promotes forms of inquiry that challenge the dominance of conceptual and methodological individualism in research on environmental attitudes and behavior (Shove 2010; Shove et al. 2012; Davies et al. 2014).

A firm focus on everyday practices may also reignite public debate about what it means to live well. In fact, treating opportunities for people to adopt, change, or abandon particular practices as essential to human flourishing in an open society could present a strong counter-narrative to prevailing discourses of material wealth and consumption as a sign of human progress. In other words, a sustainable society could be reimagined as one that provides the social and material foundation for all its members to collectively engage in practices that foster social interaction, promote the frugal use of natural resources and (re)connect people to the physical environment they inhabit. This, in turn, could fundamentally reshape sustainability thinking and practice, for example by encouraging people to either take up particular practices or drop their resource-intensive habits.

Finally, a renewed interest in practices might also help to rectify the observable lack of attention to people's everyday experiences that is evident in much (green) politics today and that is partly to blame for the patchy implementation of many sustainability policies. For example, Doughty and Murray (2016) detect considerable tensions between the institutional discourse of sustainable mobility in UK transport policy and observable everyday mobility practices among families in the Brighton area. Here, 'the policy drive towards sustainable mobilities is resisted at the micro level of everyday embodied engagement because it is easily overshadowed by mundane social and material constraints and affordances' (p. 17). Their data reveal their interviewees' strong desire to manage the mundane and to solve everyday problems related to childcare, work, or provisioning, as opposed to pursuing abstract sustainable mobility goals. These insights confirm earlier pioneering work by Freudendal-Pedersen (2009) on this subject, further strengthening the case for a practice-centred approach to sustainability.

Towards Practice-Oriented Sustainability Assessment (PROSA)

A commitment to practice-oriented sustainability thinking also requires a radical change in how sustainability efforts are assessed, with tools for practice-oriented sustainability assessment (PROSA) emerging and evolving all

the time. Recent use of participatory scenario-building, visioning and backcasting techniques that involve both social scientists and non-academic actors (e.g. community groups, NGOs, 'green' start-ups) in the collective identification of long-term sustainability goals, practical steps to reach these goals, and related efforts to assess the sustainability potential of these goals exemplifies this. For example, extensive visioning and backcasting work with key actors carried out as part of CONSENSUS, a seven-year research collaboration on consumption, environment and sustainability (2009–2015), produced a suite of qualitative scenarios and 'promising practices' concerning home heating, washing and eating (Doyle and Davies 2013; Davies and Doyle 2015). This was coupled with qualitative ratings carried out by the researchers to assess the (un)sustainability of these scenarios using six new economics criteria for sustainable consumption: (1) localization, (2) reduced environmental impact, (3) community building and collective action, (4) individual wellbeing, (5) economic sustainability and (6) new infrastructures of provision. This revealed huge variations in the sustainability gains that could be made through the various heating, washing and eating scenarios identified by key actors.

It is also worth considering what some existing and widely-used sustainability indexes would look like if they were to be adjusted to focus on everyday practices. For example, the EU's SDI incorporates more than 130 indicators, including ten headline indicators: (1) real GDP per capita, (2) resource productivity, (3) persons-at-risk-of-poverty or social exclusion, (4) employment rate of older workers, (5) healthy life years and life expectancy at birth, by sex, (6) greenhouse gas emissions, (7) energy consumption, (8) energy consumption of transport relative to GDP, (9) common bird index and (10) official development assistance as share of gross national income.[4] Many of these reflect the previously critiqued preoccupation with growth-based forms of development (e.g. real GDP per capita) while others appear to lend themselves to the kind of practice-oriented restructuring of sustainability assessment advocated in this chapter (e.g. energy consumption reflecting people's routine practices). Strengthening the latter category within the remit of this widely used SA tool could substantially advance efforts to move beyond GDP. For example, SDI headline indicator 7 (energy consumption) could be fruitfully extended to incorporate information about the prevalence and sig-

nificance in society of more or less energy-intensive practices (e.g. long-distance commuting by car versus walking or cycling to work).

Wilkinson and Pickett's (2009) work offers another starting point for the development of PROSA. Through a meta-analysis of large-scale quantitative data provided by the UN, World Bank and other international institutions, these authors convincingly demonstrate the growing income gap in developed societies and define societal progress as the closing of this gap. To compare the societal impacts of per capita income and income inequality, they use an index of ten social and health problems, including life expectancy, teenage births, obesity, mental illness, homicides, imprisonment rates, mistrust, social immobility, lack of education and infant mortality. It is suggested here that Wilkinson and Pickett's index could be fruitfully extended to 'match' each of the ten health and social problems to particular everyday practices (e.g. linking obesity to the regularly consumption of highly processed food). This would also enable those who engage in these practices to relate to and actively participate in SA efforts.

Calls also abound for the development of SA tools that are easily accessible to non-academic users such as local communities. For example, Caeiro et al. (2012) observe that 'despite the diversity of tools to measure household consumption, clearer indicators are needed to more effectively communicate with the general public' (p. 72). Here, the rapidly expanding pool of online tools for recording everyday practices and resource use (e.g. apps collecting travel data, web-based ecological footprint calculators) and the availability of affordable software for data visualization provide exciting opportunities. For example, the public art element of the Tidy Street project in Brighton (UK), a local initiative to reduce domestic electricity use by transforming everyday practices, shows the communicative power of accessible and easy-to-read displays and infographics that are placed in the public realm.[5]

What does the design and application of PROSA tools mean for the scope and scale of measurement? Valid arguments exist for increasing the use of qualitative methodologies that focus on the in-depth investigation of everyday practices. For example, Gill Valentine's (1999) highly insightful study of the relationship between food preparation and consumption and the (re)production of family relations aptly demonstrates how thorough

qualitative work can reveal variations in meaning people attach to everyday socio-environmental practices. Moreover, large-scale quantitative data can reveal the spread and popularity of particular (un)sustainable practices within society, thus fruitfully complementing meaning-centred qualitative inquiry and strengthening the case for mixed-methods approaches. Overall, a strong focus on everyday practices as a central pillar of sustainability thinking and research requires a radical shift in how (a lack of) success is conceptualized, measured, and communicated. This presents many opportunities but also considerable challenges that warrant further examination.

Sustainability as Suite of Everyday Practices? Some Critical Reflections

A practice-centred approach to sustainability reclaims everyday life and people's lived experiences as central subjects of social inquiry. It also redefines what it means to live well and encourages a view of human flourishing as an existence free from impediments to well-being rather than an accumulation of (material) wealth, challenging conventional growth-based notions of societal progress in the process. This shifts attention towards existing practices and resources and the removal of obstacles to their careful and beneficial use and encourages a 'reconcretization' of the public imagination towards an experience-near view of sustainability. The question which concrete practices people would prefer (not) to engage in either individually or in their community differs fundamentally from inquiries into their own and future generations' needs and wants and their willingness to pursue more abstract sustainability goals such as intergenerational justice. Most people are well able to name concrete activities that they either support or reject (e.g. separating household waste, littering), a fact that frequently finds expression in campaigns that target specific local issues (e.g. anti-litter campaigns). However, to articulate what it is exactly that people want both now and in the future may prove much more difficult. This appears to apply to both concrete issues (e.g. what type of house people would like to buy and in which location) and more abstract ideas (e.g. what an

alternative to growth-based capitalism might look like). This apparent preference for 'the local' and 'the concrete' has considerable implications for political and practical sustainability efforts.

Naturally, calls for a 'practice turn' in sustainability thinking and research may be met with skepticism by those who (perhaps correctly) view routine practices as a root cause of actually existing unsustainability and who attribute the lack of success of sustainability initiatives to people uncritically clinging to old habits. Yet others see many established practices as deeply rooted in local cultural traditions that promote the long-term survival (or sustainability) of a community or place (Edmondson 2000), including through the frugal use of resources. Here, an altogether more positive vision emerges that connects the creative (re)configuration of locally embedded practices to broader aspirations for a sustainable society and human flourishing. Successful local sustainability initiatives such as the aforementioned Tidy Street project demonstrate the potential of such an approach. At the same time, conflicts concerning sustainability initiatives continue to revolve around people's close connection to their local area. For example, anti-windfarm campaigners in Germany and elsewhere in Europe are often accused of NIMBY (Not-in-my-backyard) thinking by those who back renewable energy generation. These accusations are deeply problematic given that 'the backyard' might be the most suitable site for individual- and community-level sustainability action. Referring back to Sachs' typology outlined in second section, it could be argued that a *practice-centred* home perspective could help avoid at least some of the limitations of localism that he critiques.

Efforts to redirect scientific and public attention towards the resource implications and sustainability potential of everyday practices and lived experiences could also halt or even reverse the growing disconnect between people and the physical environment that sustains them. Here, attempts to drastically reduce the resource requirements of everyday practices such as those pursued by voluntary simplicity, minimalist and degrowth movements in Europe and North America spring to mind. These often advocate wide-ranging transformations of human-environment relations as a solution to growth-related social and environmental problems (e.g. Schor 2010; Hopkins 2013; Lorek and Spangenberg 2017), including a radical reorganization of the economy that reduces

paid work and consumption, promotes unpaid work, self-sufficiency and voluntarism and enhances quality of life. For example, the rise in urban gardening in both growing and shrinking cities around the world (e.g. Munich, Detroit) has increased urban dwellers' awareness of manual labour and natural resource requirements associated with small-scale food production. Importantly, urban gardeners and those who acquire their produce may learn more about previously unfamiliar sustainability problems, including food security and waste, the fair distribution of food, or the resource intensity of different diets. This said, some local projects may perpetuate a rather narrow view of sustainability that largely ignores national and global issues, even though these are equally important to understanding (un)sustainability in the food sector.

Despite many promising projects and initiatives, sustainability remains a distant goal, with at least three practice-related reasons deserving closer scrutiny. First, citizens in modern societies are often discouraged from reflecting on bigger sustainability challenges that arise from their consumption of 'solutions' to both real and imagined everyday problems (e.g. disinfectants to kill kitchen germs, water filters to further clean drinking water). Here, many forms of 'green' consumption foster a rather uncritical pragmatism that leaves limited room for questioning the significance of these problems. But perhaps this problem-focused pragmatism could be utilized to promote sustainability. For example, efforts to minimize food waste in canteens and restaurants can yield significant improvements whenever they focus on solving a concrete problem or task (e.g. using a clearly marked system of bins to separate waste). In contrast, more general appeals to think and act sustainably when purchasing food are often less effective (cf. Papargyropoulou et al. 2014).

Second, a strong 'culture of problematisation' exists in public and political debate which is partly fueled by the media and which regularly draws citizens' attention to a particular 'problem' (e.g. crime, gridlock). As a result, citizens increasingly expect politicians to solve these concrete problems (rather than provide a more holistic vision for society coupled with a wide-ranging suite of policies). The resulting expansion of 'ideology-free' politics has been heavily criticized for replacing democratic principles and practices with new forms of neoliberal managerialism, including in the area of sustainability (e.g. Krueger and Gibbs 2007;

Swyngedouw 2011). This said, this preoccupation with solving everyday problems might also hold opportunities for advancing sustainability. Perhaps a reframing of global sustainability challenges such as climate change as an extensive network of smaller, interconnected problems could open up promising new solution spaces. For instance, the problem-and-solution-focused approach to sustainable development adopted by the Transition Towns movement and many *Local Agenda 21* initiatives has generated impressive levels of citizen engagement and bottom-up, collective action worldwide (Hopkins 2013).

Finally, a focus on solving concrete problems implicitly speaks to people's capacity for ingenuity, creativity and craftsmanship, much of which currently remains dormant or under-utilised because of rampant consumerism in many developed countries—aptly described by Jon Alexander (2013) as the 'great hushing of human potential'—or struggles for survival in the global South. Reframing sustainable development as a 'problem-solving project' that uses and potentially reconfigures existing practices could perhaps help to (re-)activate these capacities. The recent emergence of grassroots sustainability enterprises, sharing initiatives, makerspaces, FabLabs and repair cafes in many Western societies suggests a new wave in a long-established 'materialist' movement that emphasises *doing* as a way of both solving everyday problems and increasing local self-reliance (e.g. Schor 2014; Schlosberg and Coles 2016).

Conclusions

Much sustainability thinking to date has rested upon a consensus view of development that treats economic, social and environmental interests as compatible and reconcilable. This sharply contrasts with evidence of the often conflict-laden relationship between the desire for economic growth and societal advancement, and the need for environmental protection and frugal resource use. Moreover, many important conceptual and methodological challenges have hitherto remained unaddressed in sustainability research and assessment, with political institutions such as the UN or the EU, national and regional

governments and local communities deploying forms of SA that uncritically perpetuate the growth-dependent and 'consensus model' of sustainability. Although criticism of this model has produced alternatives such as conflict, degrowth and sufficiency perspectives and related attempts to develop new SA tools beyond GDP, many of these have yet to achieve broader recognition in sustainability research, politics and practice. Consequently, important societal processes that create, shape and lock into place (un)sustainable environment-society relations continue to be poorly understood and largely absent from public debate and policy.

This chapter put forward arguments for an alternative approach to sustainability and development that views the accumulation within society of less resource-intensive socio-material practices as integral to human flourishing. It revealed that practice-oriented sustainability thinking and assessment could provide fresh impetus for the development of more accessible and inclusive sustainability initiatives and assessment tools that are co-designed by citizens, communities, scientists and policy-makers. A critical light was also cast on current trends in sustainability research towards quantifying economic benefits and losses and environmental degradation, at the expense of meaningful measurement of key sustainability challenges such as the unequal distribution of environmental resources and threats within and across societies. Undoubtedly, exciting proposals exist for alternative SA processes and tools. However, further conceptual work is urgently needed to identify, compare, and potentially challenge the theoretical and conceptual underpinnings of existing and emerging SA tools. Overall, strong arguments exist for a radical 'broadening of the present' whereby creative solutions to sustainability challenges speak to and work with people's everyday practices, and complement rather than replace a long-term, future-oriented vision for sustainability. Removing barriers people face when trying to adopt less resource-intensive practices could support their efforts to 'manage the mundane' more sustainably. A practice-oriented approach to sustainability and the careful application of PROSA could help to identify such barriers and promising pathways, significantly advancing sustainability research, policy and practice in the process.

Notes

1. Shove (2010) offers a detailed critique of what she labels the Attitudes-Behaviour-Choice (ABC) model of human behavior. Similarly, Edmondson and Hülser (2012) offer a multi-facetted critique of excessively cognitivised ways of conceptualizing reasoning itself.
2. https://www.iisd.org/measure/compendium/searchinitiatives.aspx, accessed 14 August 2015.
3. https://www.iisd.org/measure/compendium/searchinitiatives.aspx, accessed 14 August 2015.
4. http://ec.europa.eu/eurostat/web/sdi/indicators/ (last accessed 15 April 2017).
5. https://collabcubed.com/2011/11/01/the-tidy-street-project/ (accessed 14th April 2017).

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11

Environmental Justice

J. Timmons Roberts, David Pellow, and Paul Mohai

Introduction

"Environmental racism" burst onto the U.S. national political and academic radar in 1982, when civil rights activists organized in Warren County, North Carolina, to prevent the state from dumping soil contaminated with toxic polychlorinated biphenyls (PCBs) in the county with the highest proportion of African Americans. The protests led the Commission for Racial Justice of the United Church of Christ to ask whether Warren County was part of a national pattern. In 1987 they sponsored a national-level study, entitled *Toxic Wastes and Race in the United States,* which found that race is the best predictor of where hazardous waste sites were located (Bullard et al. 2014). These and other events spawned a chain reaction, including a landmark 1990 *Michigan Conference on Race and the Incidence of Environmental Hazards*, the publication of Robert Bullard's *Dumping in Dixie*, and the 1991 National People of Color Environmental

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Leadership Summit (Bryant and Mohai 1992a, b). After sociologist Bullard served on his transition team, in 1994 President Clinton issued an Executive Order that called on all the agencies of the U.S. government to take into account the environmental justice consequences of their rule-making (Mohai et al. 2009).

From the beginning, an interdisciplinary academic subfield of environmental justice studies developed alongside the environmental justice movement by the same name. Researchers sought to document the unequal impacts of environmental pollution on different social classes and racial/ethnic groups, and to understand the dynamics and potential of the EJ social movement to reshape everything from the larger environmental movement, government policy on environment, and even the shapes of cities and rural communities. Often, scholars participated in the social movement, and their research findings supported claims made by communities and activists.

Academic interest in environmental justice has been strong and enduring in sociology, law, geography, urban planning, public health, economics, political science, and others. A series of searches using Google Scholar in February, 2017 showed that the concept is alive and perhaps surging in use. From just 76 uses of the exact phrase "environmental justice" in the first half of the 1980s to 159 in the second half, sources with the phrase rose to 1220 in 1990–1994 and 5240 in 1995–1999. Citations rose to around 12,000 in the early 2000s, and 16,300 in the late 2000s. From 2010–2014 the number rose again to 18,600. To our surprise, in both 2015 and 2016 over 8200 publications used the phrase "environmental justice," showing record levels of usage each year. The concept has been mainstreamed into city, state and national planning efforts, into university courses and international organizations. Certainly Christopher Foreman's 1998 prediction that Environmental Justice would quickly become a distant memory has been resoundingly disproven.

Environmental justice scholarship and movement building have long been evident around the world, including in struggles over the meaning of citizenship and rural space in an increasingly multicultural Britain (Neal and Agyeman 2006); conflicts among indigenous peoples, governments, and corporations in Latin America (Partridge 2016);

an exploration of the environmental injustice dimensions of the South African apartheid regime (Stull et al. 2016); environmental justice struggles among First Nations and settler colonies in Canada (Agyeman et al. 2009); explorations of global and transnational environmental justice movement networks in Asia, Africa, the Caribbean, Eastern Europe, and Latin America (Pellow 2007); and emerging environmental justice concerns in Russia and the former Soviet Republics (Agyeman and Ogneva-Himmelberger 2009).

If environmental sociology is the study of the interactions between society and the environment, then the sociology of environmental justice can be seen as the study of the interactions between a differentiated society and a differentiated environment. That is, different social groups are differentiated in their access to resources, power, privilege, and opportunities. These groups have different access to environments that can either enhance or harm human health and a sense of well-being. Mechanisms enhancing well-being include providing access to clean air and clean water, open space, natural areas and parks. The most obvious harmful mechanisms include air and water pollution, hazardous wastes, and other forms of environmental degradation and contamination. There are many other indirect and more complex mechanisms driving unequal access to goods. Social groups with greater resources, wealth, power, and privilege have greater access to the beneficial qualities of a relatively uncontaminated and unspoiled environment, while those with fewer resources, wealth, power, and privilege are instead faced with disproportionate burdens of pollution and other environmental hazards of a wide variety.

A sociology of environmental justice seeks to understand how inequalities among groups lead to inequalities in access to environmental benefits and inequalities in exposure to environmental burdens. It also seeks to understand what role different social groups play in their impact on the environment and the consequences of those impacts on other groups. Finally, a sociology of environmental justice attempts to understand the social bases and formation of civil society organizations mobilizing to protect their local and wider environment and the outcomes of their efforts. In the end, the field seeks to answer a singular question loaded with complexity: how did things get this way, and how can they change?

In turn, perhaps the greatest contribution of the environmental justice concept to sociology has been the unrelenting insistence that social inequalities be considered in all analyses of how humans and the environment interact. This applies from the smallest to the largest scales. For example to understand segregation and its unequal impacts on minority populations in inner-city neighborhoods, it is not enough to simply characterize social shortfalls in education, employment, housing, etc. Rather, minority groups in the inner-city are being measurably and more frequently exposed to often devastating levels of brain-damaging, life-threatening, and birth-defect creating elements like lead, mercury, mold spores and cancer-causing agents. They lack access to safe and green places to exercise and their neighborhoods lack tree protection, making them the most unhealthy segments of the "urban heat island." At the other end of the scale, to understand global climate policy, for example, attention to environmental justice concepts requires that the relative power of small and poor nations be considered, their disproportionate vulnerability to sea level rise, droughts and floods, and steps be developed to address those inequalities in policy development and outcomes. Environmental justice scholarship militates against reductionism in Sociology and in environmental science and policy: one would happily ignore non-social causes and outcomes, the other would just as soon ignore inequality and injustice.

This chapter seeks to clarify the substantial impact of environmental justice on scholarship and policy-making by addressing the core questions of this volume. What are the underlying assumptions upon which environmental justice rests? What is new and innovative about this concept? What is missing in these conversations? The chapter seeks first to review importantly different definitions of environmental justice, and then moves on to the core debate about what causes environmental inequality. Three primary arguments have been raised: economic, sociopolitical, and racial discrimination explanations. Understanding the roots of environmental inequalities is fundamental to developing policy that can be effective in combating it. As a case study and emerging area of environmental justice practice and scholarship, we review how "climate justice" has been framed and advocated within nations and at the

United Nations climate change negotiations. Our final thoughts are on what we think have been under-investigated areas of concern and how a globally-relevant environmental sociology might contribute to better understandings and more effective public policy to address environmental justice.

Definitions of Environmental Justice

What are the underlying assumptions upon which environmental justice rests? What is new and innovative about this concept? Is this a significant theoretical or epistemological turn, with the potential to support a fundamental shift in environment-society relations? One of the most central concepts in environmental scholarship and policy concerns the distribution of environmental "goods" (access to natural resources, parks, natural areas and aesthetic surroundings) and "bads" (exposures to risks, pollution, blight). The concept of environmental justice has redefined the terrain of how society and environment interact, forcing a rethinking of how environmental policy is carried out. But this impact has been incomplete, and its future is uncertain in many countries. Environmental divisions follow cleavages found in many other areas, with race[1], ethnic, class and gender dimensions driving many of the inequalities that we can observe in who gets the goods and who gets stuck with the bads. Such inequalities can be found in the local context or on a global scale, and is also implied in phrases such as inter- and intra-generational justice.

When this issue began to emerge in the 1980s, a number of terms were used to refer to racial and socioeconomic disparities in the distribution of environmental hazards. These included such terms as "environmental equity", "environmental racism", "environmental discrimination", and "environmental justice". There have been debates about whether these terms refer to the same phenomenon or whether they have distinctly different meanings. The term "environmental racism" was defined by Benjamin Chavis, then head of the Commission for Racial Justice of the United Church of Christ, in 1982 as "racial discrimination in environmental policymaking, the enforcement of regulations and laws, the deliberate

targeting of communities of color for toxic waste facilities, the official sanctioning of the life-threatening presence of poisons and pollutants in our communities, and the history of excluding people of color from leadership of the ecology movements" (Bullard 2000: 278). Robert Bullard (1996: 445) defined environmental *justice* as the principle that "all people and communities are entitled to equal protection of environmental and public health laws and regulations."

In 2000 law professor Robert Kuehn reviewed these various terms and attempted to elaborate on the full meaning of what "environmental justice" is. He broke the concept into four distinct components, referring to them respectively as "distributive justice", "procedural justice", "corrective justice", and "social justice" (Kuehn 2000). Distributive justice refers to inequalities in the distribution of neighborhood environmental quality, both bad and good, such as the presence (or absence) of contaminated sites and air and water pollution in neighborhoods and the absence (or presence) of trees, parks, open space in them. Procedural justice refers to the presence or absence of meaningful opportunities provided for residents to influence government and industry decisions affecting their communities. Are such opportunities provided only or mostly to more affluent and white communities, for example? Corrective justice refers to the presence or absence of adequate remedies and compensation to communities that have been harmed and injured by environmental contamination. In discussing the concept of social justice, Kuehn argued that environmental injustice is embedded in a larger context of social injustices that people of color face, such as inequalities in access to educational, economic, political and other opportunities. He argued that environmental injustices cannot be disentangled from this larger social context and are likely to persist as long as these other forms of social inequality also continue to exist.

In the U.S., the Environmental Protection Agency (EPA) has offered a definition, describing Environmental Justice as "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation and enforcement of environmental laws, regulations and policies." EPA's definition leaves open important questions about what level of disparity rises to the level of actionable injustice to receive government attention (Roberts and Toffolon-Weiss 2001).

Steps to Identify, Confront and Remedy Environmental Injustices

Two core questions drove the literature and the policy of environmental justice, in part because policy and politics demanded convincing science. First, are economic class differences or race more powerful in explaining a household's likely exposure to toxic contamination? Second, "which came first"—did polluting industrial facilities move into people of color and working class neighborhoods, or did poorer people move where the land was cheapest (and where it was polluted)?

Hundreds of studies have now attempted to shed light on these questions, the vast majority documenting unequal exposures to toxic chemicals by race, class, gender, ethnicity, and citizenship (See e.g. Mohai et al. 2009 for a review). Key methodological advances in the subfield—such as the use of GIS for analyzing likely exposures to risk, rather than simply coincidence of a polluter and a household in the same zip code—have been adopted by social scientists more broadly (Chakraborty et al. 2011; Mohai and Saha 2006). So in this way, the methods of environmental justice have influenced social science. Risk-based approaches took into account air pollution risk from both industrial and mobile sources. Hazard exposure studies, such as those by Ash and Fetter (2004) and Zwickl et al. (2014), show that African-Americans live in the most polluted cities in the U.S., while Hispanics, although living in less polluted cities, live in their most polluted parts.

Which aspects of racialized social experience—housing discrimination, deliberate targeting of minority neighborhoods for society's unwanted land uses, or other factors—are causing environmental inequality? The finding that racial disparities persist even when socioeconomic characteristics are controlled for in multivariate analyses of exposures suggests further investigation is needed of the causal links between racial characteristics and environmental inequality. This has major implications for political and public policy developments.

The issue of whether polluters follow minorities and the poor or whether the causal arrow runs the other way is extremely important if we are going to address the environmental justice disparity. Answers to this question have both policy and political implications. Regarding policy, it

may be a futile effort to try to control the siting process to avoid disparities in the concentration of racial and socioeconomic disparities around locally unwanted land uses (LULUs), if inevitably people of color people and the poor tend to move near to such sites driven by economics or de facto segregation (Pastor et al. 2001). Conversely, if the disparities exist because industry and government tend to move into poor and people of color communities, then laws and other policies could be passed and implemented to discourage such decisions. Answers to the "chicken or egg" question in environmental justice have been difficult to find since there have been so few of the kind of longitudinal studies needed to determine which process happens first. In a recent review of such studies, Mohai and Saha (2015a) found studies to be inconclusive and even contradictory, blaming the imprecision of earlier methods. Newer "distance-based" method studies, which more accurately assess the demographics around hazardous sites, find a consistent pattern of siting new hazardous waste treatment, storage, and disposal facilities (TSDFs) disproportionately where people of color and the poor are concentrated (Mohai and Saha 2015b). Although they found racial and socioeconomic disparities around these locations to increase even further after a siting, they discovered that the demographic changes were already occurring *before* the facilities were constructed. These findings led them to conclude that new hazardous waste facilities tend to be located in areas that are already disproportionately poor and populated by people of color *and* where their numbers are growing. They discount the earlier notions that such facilities "attract" the poor and people of color.

Why Environmental Injustices Exist: Economic, Socio-Political, and Racial Discrimination Explanations

While there are debates among scholars as to what the precise driving forces behind environmental inequalities might be, researchers have advanced a number of important perspectives on this question. We find that there are three primary arguments that can be grouped under the

following labels: economic explanations, socio-political explanations, and racial discrimination explanations. What these studies aim to do is to move beyond documenting the fact of environmental inequality and to offer reasons for why these disparities exist in the first place.

Economic explanations focus on "market dynamics" and the logic of capitalism (see, e.g. Been 1994; Saha and Mohai 2005). The principal argument here is that the spatial concentration of polluting industries in communities of color is the result of market forces that naturally compel firms to seek cheap land and labor. However, places where cheap land and labor exist may often be places where low income and people of color also live. Furthermore, once polluting industrial facilities and other LULUs have been sited, the negative consequences of such facilities, such as pollution, visual blight, community stigmatization, and others, may drive down property values, thus making housing more affordable and attractive to increasing numbers of poor people and people of color. The move-in of poor people and people of color are thus also seen as the result of market forces. The limitation of these economic explanations is that it views market forces as somehow race-neutral, when racially unequal outcomes are nevertheless evident and left unexplained.

Socio-political explanations generally contend that power and politics drive environmentally unequal outcomes (Bullard and Wright 1987). Specifically, communities with lower levels of education, voting behavior, home ownership, social capital, and political clout are more likely to be targeted by polluting firms because they are seen as the "paths of least resistance". Communities that bear these characteristics are all too often poor communities and communities of color. Scholars have demonstrated that, historically, organized opposition to locally unwanted land uses grew in the 1970s within white communities. The success of white NIMBYism (Not In My Backyard) in turn has led to an increasing number of hazardous waste sites, polluting industrial facilities, and other LULUs being sited in the less privileged communities with the least resources to fight back (Saha and Mohai 2005).

Racial discrimination explanations seek to address head-on the legacy of institutional racism and its continued existence and impacts on environmental justice outcomes via urban planning, residential segregation, zoning, and a host of other practices and policies that emanate from government agencies (Feagin and Feagin 1986). This area of scholarship seeks to move beyond the

traditionally narrow question of whether racial animus or racist intent drives environmental inequality and, instead, explores the role of historical and ongoing institutional actions that result in racially unequal and discriminatory outcomes. In other words, the point of institutional racism is that it recognizes that ill-will or bigotry are not required to produce racial discrimination—the everyday functions of mainstream institutions can result in environmental racism in the absence of openly racist attitudes and viewpoints because racial privilege and disadvantage are built into the society's social structures and systems of governance and commerce (Pulido 1996, 2000). Historic racism thus continues to impact the lives and public health of people living in urban areas even today (Michigan Civil Rights Commission 2017).

But we should be cautious about reducing racism entirely to material politics, since there are very important cultural, legal, and social-psychological elements of this phenomenon, as we have been reminded by scholars from the fields of Critical Race Theory and Ethnic Studies. For example, philosopher Charles Mills (2001) argues that there are longstanding associations in western culture between images of people of color and waste, filth, dirt, and contamination. We find this in popular culture as well as foundational philosophical texts and scientific tracts of the past. Thus, if certain groups of people are associated with pollution and waste, then it becomes that much easier to treat them unequally in social policy making, and that much easier to concentrate pollution and industrial waste in their communities (Higgins 1994; Mills 2001; Ray 2013).

The above three categories of explanations—economic, socio-political, and racial discrimination—are, of course, not mutually exclusive, and frequently overlap and intersect. For example, government decisions are always political in nature, they always have economic consequences, and tend to produce racially uneven impacts. Market forces always have political consequences and tend to result in racially unequal outcomes. And racial discrimination is often driven by political motivations and almost always has observable impacts for markets and economic systems. So the separation of these explanations into three categories is really done only for the purposes of analysis, since in social reality they are inseparable (Mohai and Saha 2015a, b). Since the nineteenth century, people of color populations have devised innovative methods of calling attention to these injustices and seeking to overcome them (e.g. Taylor 1997, 2009).

Just Sustainability and Climate Justice

Scholarship and policy discourses on sustainability have been in the works for many decades. Perhaps one of the most impactful was the Brundtland Commission's 1987 definition of sustainable development, which they defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." While this definition of sustainable development speaks to concerns over intergenerational justice and equity, many scholars have critiqued this perspective as limited in that it fails to sufficiently address equity concerns. It also implies that all that is needed is a more efficient use of natural resources, when many scholars contend that we must question the very framing of "nature" as primarily if not exclusively a "resource" intended for human purposes. Julian Agyeman's concept of "just sustainability" speaks to some of these concerns, arguing that efforts need to be made on *both* equity and environmental sustainability—that addressing one does not automatically solve the other (Agyeman et al. 2003: 5). Building on those ideas, more recent scholarship seeks to push scholars, policy makers, and advocates to address the problem and need for "resilience" in society and ecosystems. Resilience has been defined as "a capacity for successful adaptation in the face of disturbance, stress, or adversity" (Norris et al. 2008: 129). Another way of defining resilience is that it is the functional capacity of cities and communities to bounce back after an external shock.

While theories, discourses, and policies focused on sustainability emphasize the need to find equilibrium between growth and conservation without jeopardizing future generations; resilience thinking focuses on the necessity for adaptability to anticipated social and environmental changes. Caniglia et al. (2017) emphasize that resilience thinking and practice must also take into account "injustices-in-waiting"—those underlying social, economic, political, and ecological vulnerabilities that that many communities already face, that can exacerbate the impacts of future socio-ecological threats such as "natural" disasters and other phenomena. As Caniglia et al. point out, numerous examples highlight that overall community functions can bounce back while many vulnerable individuals and groups do not. To build more sustainable cities, the vulnerability and resilience of different individuals and groups to a changing

environment and climate need to be reflected in the planning of buildings, streets and communities (what some scholars call "just resilience"; see Chu et al. 2016; Anguelovski et al. 2016).

With the success of the environmental justice concept in academia and the important gains of the social movement of the same name, the issue was widely globalized, sometimes explicitly by groups of academics and activists (Roberts and Parks 2007; Pellow 2007). One such effort was to apply the concept of environmental justice to climate change, which began about 2001. The Durban (South Africa) conference on racism in 2001 led to the creation of an international network on climate justice, and a new Climate Justice Now! network split off from the mainstream Climate Action Network of NGOs in 2007 (Harlan et al. 2015).

The central environmental justice insight that impacts do not affect a uniform human landscape, but rather happen in societies riven by steep differences within and between them, applies in the case of climate change vulnerability (Kasperson and Kasperson 2001). Societies are divided in who most caused the problem in the first place (wealthier nations and individuals), who is suffering most its impacts (the poor and those without diversified income), and also between those who have shown their willingness to take the kinds of actions needed and those who are dragging their feet (Roberts and Parks 2007). Beyond being unequally caused and experienced, climate change also can worsen social inequality, by taxing the meager coping resources and monetary reserves of the poor and subordinate minorities. This was perhaps most shockingly revealed in the aftermath of Hurricane Katrina, and the savage inequalities in vulnerability and the worsening of inequality among those with capacities to evacuate and rebuild after the storm (e.g. Bullard and Wright 2009; SSRC 2005). The sociological insight is to emphasize and examine "the contextual factors that structure vulnerability to hazards and the linkages that exist between vulnerability and social power" (Tierney 1999:215). In this way applying environmental justice insights to the case of climate change has raised important issues for the field, such as intentionality, identities of vulnerability, and symbolic power in battles over governance regimes (Ciplet et al. 2015).

Climate justice has been brought into the United Nations negotiations repeatedly, with varying levels of success (Ciplet et al. 2015). For example, after the 2010 people's climate conference in Cochabamba, Bolivia,

the country's government submitted a series of strong demands for justice on the issue, including sharp reductions in emissions by the wealthy nations and steep increases in funding delivered to help poorer countries cope with climate impacts and green their economies. Surviving in a couple rounds of draft texts as options, nearly all climate justice language was eliminated before the United Nations conference in Cancun, Mexico final documents were finalized and approved later that same year. In the Paris negotiations in 2015, climate justice issues were largely shifted to the preambular text, which included strong language but which has absolutely no force. In this way, the radical demands of climate justice have been repeatedly sidelined and when they do have an impact they are greatly watered down.

Beyond the site of consumption and the U.N. climate negotiations, activists have increasingly focused their attention on three crucial points in the fossil fuel supply chain: the sites of extraction, transport and processing. The "Beyond Coal" and "Appalachian Voices" campaigns focused especially on the mountaintop removal technique of accessing underground coal seams. A series of environmental organizations focused on toxic exposures to communities around the Richmond, California Chevron oil refinery such as Communities for a Better Environment and the West County Toxics Coalition joined up with climate movement organization 350.org for a protest of the plant in 2013 (Beans 2013). And pan-indigenous movements are taking on pipelines running through their ancestral lands, most famously the massive Dakota Access Pipeline protests, a multinational gathering featuring the largest number of representatives from indigenous nations in the U.S. in more than a century. Moreover, numerous networks and organizations around the world have taken the lead on facilitating global and transnational conversations and actions on climate justice, including the Mexico-based global network La Vía Campesina, the U.S.-based global group Indigenous Environmental Network, and Canada-based Idle No More.

In many cases divisions emerge within and between communities of those requiring revenues and jobs from fossil industries and those saying that these facilities are threatening to their long-term security. These same fractures occur between groups wishing to participate in schemes to *address* climate change, such as carbon trading through purchasing emissions offsets

programs. In these ways, environmental justice movements are shifting dialogues and actions by environmental social scientists and environmental activists. Environmental impacts can no longer be seen as occurring in a world without sharp divisions in resources and power; in turn they require that we bring concrete environmental impacts into social theory.

Where Has EJ Been and What Has Been Missing in These Conversations?

Agyeman et al. (2016) demonstrate that environmental justice research is now closely linked with and expanding into areas of food justice, energy justice, and climate justice, revealing how the boundaries of EJ studies have been porous and fluid enough to reveal a multi-issue, multi-sectoral approach to knowledge production and scholarly inquiry. Industrial pollution and waste and their relation to differential illness rates continue to drive significant research interest. Exposures by race, ethnicity, income and gender in workplace, schools, and neighborhoods are still not well measured, and the impacts of poor housing, poor schools, health care, nutrition, recreation, psychological stressors, etc. are not well understood.

What is missing in these conversations? How can a globally relevant environmental sociology contribute to better understanding and coping with our most demanding environmental problems and risks today and in the future? Moving from the literature itself, we notice many case studies but an important lack of longitudinal studies (see Mohai and Saha 2015a, b). More historical studies are needed—Dorceta Taylor's pioneering work (2009) chronicling the long racial history of American cities is a model. Elliot and Frickel (2015) have taken a new direction to examine "relic industrial sites" caused by industrial and residential "churning," making exposure profiles very complex for urban residents (an unknown proportion of those sites remain dangerous).

In addition, we encourage more meta-analyses of in-depth case studies to examine their common characteristics and what factors led to community mobilization and success (e.g. Bullard 1990; Lerner 2006). Needed are newer studies and a broader picture of the achievements of the movement and their impact on wider struggles for social change and democratization

in an age of neoliberal economics, globalization and Right-wing populism. Particularly valuable would be an in-depth examination of the current Flint Water Crisis, a majority African-American city which some have described as "the most egregious example of environmental injustice and racism in the past three decades" (Michigan Civil Rights Commission 2017; Mohai 2016; Flint Water Advisory Task Force 2016).

One of the limitations in the EJ conversations is that, as much as Environmental Justice Studies has grown into a multidisciplinary field, there are ways in which scholars in the social sciences can and should do a better job of linking their work to the research of scholars in the environmental humanities. The environmental humanities offer openings and perspectives that are not bound by strict conventions of scientific and social science, but rather allow for more flexible approaches to (re)defining and rethinking the parameters, methods, and goals of environmental justice studies. One good example of this linkage that has clear implications for EJ studies is literary scholar Rob Nixon's (2013) concept of "slow violence." Nixon defines this as the type of violence wrought by, for example, climate change, toxic drift, deforestation, oil spills, and war; it is a form of violence that takes place gradually and often invisibly, which is problematic because it can easily be missed or ignored since it unfolds at such a gradual pace. Drawing on a range of literary texts from novelists, poets, and others, Nixon's plea is that we take slow violence seriously because it is distinct from the spectacle-driven, sensational messaging and images that tend to dominant scholarly and activist discourses around environmental threats. Moreover, the use of the word "violence" to describe climate change, deforestation, and oil spills is exceedingly important because it reflects the fact that the impacts of these phenomena are deeply consequential for humans and nonhumans and they are attached to persons and institutions who can be held accountable.

Another aspect of EJ studies that we believe deserves consideration might be greater attention to the fields of Urban Political Ecology and Actor Network Theory. These are fields in which scholars across various disciplines are grappling with important questions like how we might reconceptualize, for example, cities, dammed rivers, and genetically modified organisms as "socionatures"—human and more-than-human hybrids and assemblages (Heynen et al. 2006; White and Wilbert 2015).

Political ecologist Jane Bennett's book *Vibrant Matter* suggests that the interactions, entanglements, and inseparability between humans and "more than humans" implies that we need to rethink what we mean by the public, the polity, and democracy itself. (2009). EJ studies might think of nonhuman ecosystems as not only being placed in harm's way by various rapacious industrial and governmental policies and practices, but as potential actants, agents, and collaborators in the process of mobilizing for environmental justice. That is, while EJ scholarship has been fairly consistent about framing the harms associated with socioecological crises in socionatural terms (that is, both humans and ecosystems suffer), the literature has generally not conceived of those actors responding to these crises in socionatural terms, just in social terms (i.e., only humans are seen as agents; see also White et al. 2015).

More practically, there are fundamental questions of whether mainstreaming consideration of environmental justice can lead to better management of how society addresses urban, social, and economic policy. What do we do with all this information of disparate impacts? Enforcement of existing pollution laws of course is needed, but EJ research and principles could drive fundamental rethinking of how to organize extraction, transport, processing and distribution of fossil fuels, and how quickly and how we get society off of them entirely. Seemingly, such concerns would lead to the rapid transition to renewable energy and sharp reductions in energy waste to prevent new sources of pollution, but there will need to be attention to community-led solutions to avoid that transition simply profiting wealthy investors and perpetuating, or even worsening, inequality. A "Green New Deal" or "Just Transition" will require focus on positive opportunity creation for those at the bottom of the socio-economic ladder. What would progress look like? What might EJ look like in a low-carbon society? What are the critical ingredients for that? Toxics use reduction, life cycle design, ecological design, biomimicry—and getting beyond a faith in purely technological fixes—are needed (White et al. 2015). Rather, we believe that the social side of this transition—attention to communities and workers and a sociological perspective of equity and justice by race, class, gender will be crucial to its enduring success. By attending to community participation in decision-making and planning, governance systems can garner more trust, which in turn

can drive more ambitious actions towards sustainability (Klinsky et al. 2017).

Though environmental justice studies has traditionally focused on race and class inequalities, scholars have explored other intersections of inequality and the environment in recent years. A small but growing group of researchers have focused on the ways that gender and sexuality shape the terrain of ecological inequalities, but those areas of scholarship remain in need of further development (Bell and Braun 2010; Buckingham and Kulcur 2010). In a quantitative study of residential proximity to industrial polluting facilities, Mohai et al (2009) found no statistically significant disparities in the concentration of people around polluting industrial facilities based on gender. However, scholarship in gender, feminist, and queer studies generally pursues different methodological and conceptual approaches (distinct from much of the social science literature on environmental justice studies), some of which have noted the importance of a focus on the human body, which opens up numerous possibilities for EJ Studies to expand. For example, as Stein writes, "When … we view our bodies as 'homes,' 'lands,' or 'environments' that have been placed at risk, stolen from us, and even killed due to social or physical harms that may be exacerbated due to our gender and sexuality—we may understand the need for new perspectives on environmental justices that encompass such factors within our analysis …." (Stein 2004: 2). This observation emerges from research demonstrating that the sexuality and reproductive capacities of women of color, immigrant women, and Indigenous women have long been the targets of state authorities, with varied and troubling consequences for human health, cultural integrity, and ecological resilience. A prominent example: a justification for the conquest of the America's lands and peoples was largely shaped by a contempt that European settlers and religious leaders had for diverse sexualities and sexual practices among Indigenous peoples in the Western Hemisphere (Smith 2005).

From its birth in Warren County nearly four decades ago, environmental justice is being used more than ever in the scholarly and policy literature. While there are vast unmet promises in attempting to address unequal access to society's "goods" and exposure to its "bads," the idea is clearly institutionalized in academic and policy circles. The economic, socio-political and racial explanations for why environmental injustice

exists drive different explanations for existing patterns and divergent policy approaches to address the issue. As it heads to the end of its fourth decade, EJ research has a vast open agenda with great promise, both within national and local realms, and at the international level.

Notes

1. Contrary to popular belief in many societies, there is no biological basis underlying the phenomenon of "race." Instead race is a social category or social construction that reflects social conflicts and interests through referencing human bodies and populations believed to be different. Racial categories and meanings are constantly being transformed by political struggles, primarily through what Omi and Winant (1994) call "racial formation," which is "the sociohistorical process by which racial categories are created, inhabited, transformed, and destroyed" (p. 55). Racial formation is also the process through which various populations come into being as a "race" through state policy making and legislation. Therefore, racial formation is not only the way that various groups are assigned a racial category; it is the mechanism and process through which various social forces shape the meaning of those categories. For example, in the United States, it is not just that a person is white, Latino, Asian American, or African American, but it is what those categories have come to mean to society, and how it promotes privilege, disadvantage, and variable life chances. In that sense, it is less sociologically useful to define what race *is* than to define what race *does*. What race and racism do, then, is to enable processes in which a dominant group (for example, whites) makes demeaning assumptions and characterizations about an out-group based on beliefs about alleged cultural, physical, intellectual differences. These assumptions and characterizations are then used to justify denying rights and privileges to the out-groups by the dominant group. This is why race has taken on importance in the U.S., not because it is a biological construct but because it is a social construct used by dominant groups to maintain their privilege over out-groups. The attitudes and actions of the dominant group have had real consequences on the life chances of racial minority groups in the U.S. These actions and consequences go beyond what can be explained by income and other socioeconomic differences alone. That is why race is an important concept in the U.S. and is neither trivial nor should it be dismissed.

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12

Environmental Democracy: Participation, Deliberation and Citizenship

Frank Fischer

The call for environmental democracy has been part of the modern environmental movement from the outset. Although support for a democratic approach to the environment has not been shared by all environmentalists, at least not as a primary concern, it has always been basic to the progressive wing of the environmental movement. Environmental democracy is "rooted in the idea that meaningful public participation is critical to ensure that land and natural resource decisions adequately and equitably address citizens´ interests." It is seen to rest on the "right to free access to information on environmental equality and problems", the "right to participate in meaningful decision-making," and the "right to seek enforcement of environmental laws or compensation for harm" (Environmental Democracy Index 2017). Taking note of the fact that "environmental democracy can be defined

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in somewhat different ways," Work and Ratte (2014) find the common thread running through all of them to be "the belief that citizens affected by environmental concerns should have equal rights in participating in environmental decision-processes."

Over the past forty years or more, this connection between environmental participation and democracy has in many quarters of the environmental movement come to more or less be taken as essential for a sustainable future.[1] Indeed, the literature on democracy and environment constitutes a long list of leading scholars in the field (see, for example, Dryzek 1995; Mason 1999; De Shalit 2000; Shiva 2005). Despite these writings, however, the concept of environmental democracy is not precisely defined. Moreover, many writers refer to the terms such as ecological democracy, green democracy and eco-democracy to mean the same thing.

Others have sought to draw out distinctions among these various concepts, particularly with regard to the use of environmental democracy versus ecological democracy. Dobson (1990), for example, has argued that the emphasis on ecology, or what he calls "ecologism," captures the need for a deeper understanding of green politics than the concept of environment. Part of this deeper understanding—sometimes referred to as "dark green"—is often seen to connote recognition of a role for non-human as well as human participation in ecological politics. It also recognizes the need to represent future generations, including people not yet born. Moreover, others employing environmental democracy sometimes consider the nonhuman dimension as well (Mason 1999). The difference between these concepts, in short, is not obviously captured through a semantic conceptual change (Torgerson 1999; Luke 2009).

In the discussion that follows we outline the theories and practices generally associated with the concept of environmental democracy. We do this recognizing that there is a progressive/liberal and a radical/participatory democratic version of environmental democracy (the latter often—but not always being referred to as ecological democracy). Whereas the first generally presents itself as "strategy" for steady but relatively incremental change within the constraints of liberal-capitalist political systems—that

is, pushing the limits of the possible—the radical variant puts the emphasis on the need for more fundamental challenges to existing structures and the constraints they impose. As such, it typically offers a more idealistic perspective that speaks to the possibilities of longer term strategies. In the space available, it is difficult to do justice to both perspectives. But it is nonetheless possible to outline the basic themes running through both versions of environmental democracy.

It is also important to note that environmental democracy in its various forms is the product of a mix of environmental struggles and environmental political theorizing. To understand environmental democracy it is thus essential to recognize the long connection between environmental democratic politics and the environmental theories of which the concept of environmental democracy is a part. It is important, in this regard, to begin with the role of participation.

Environmental Participation as Democratic Foundation

Democratic politics in all of its forms is about citizen participation. Most typically systems identified as democratic feature formal political structures in which citizens have the right to participate. The stability of such systems depend on legitimacy derived from this participation. While existing systems generally support competitive pluralist polities, few are genuinely democratic. A major reason has to do with the inequalities that these systems are built upon. This is especially the case in "capitalist democracies," as such economic systems by their nature generate inequalities.

The public participation of citizens has always been basic to democratic environmental politics generally. The theory and practice of such participation can be traced back to the modern environmental movement in the late 1960s, when it was widely seen to be part of a post-material cultural shift in Western societies emerging at that time (Ingelhart 1971). Involving an emphasis on the values of self-expression and self-determination, this value shift included a call for decentralized forms of local participatory democracy. For some, it even involves self-governance in civil society. By the

1990s, such thinking came together in both the theory and practices of environmental movements and green political parties (De-Shalit 2000: 135–145). Democratic participation, as a result, became seen by many as essential for resolving environmental problems and even more importantly the creation of an ecologically sustainable society (Hayward 2013; Beierleand Cayford 2002).

In more recent years, this emphasis on democratic environmental participation has been extended to a host of global transboundary problems, such as biodiversity, deforestation, toxic waste and climate change, among others. As these problems reach beyond the boundaries of nation-based representative systems, thus rendering their governance problematic, they have given rise to discussions about global environmental democracy. No problem better illustrates this than the struggles around climate change. Welzer and Leggwie (2009), for example, assert that citizen participation must be an essential component of a future climate policy; the reconstruction of industrial society is seen to only work when the members of society can understand and identify with it, which requires that the affected participate in the "operationalization" of climate policy thinking (2009: 41). Siller (2010) insists that a solution to the climate crisis can only be made to work through citizen participation and democratic processes. Similarly, Hayward (2013: 3) maintains that the response to climate change requires citizen participants "who can think and act responsible in the interest of all."

Beyond scholarly literature, the participatory principles of environmental democracy are also enshrined in official environmental documents, such as environmental impact assessment laws, right-to-know laws and the various U. N. documents spelling out sustainable development. One of the early democratic initiatives in the US in the early 1970s was to build public participation into the landmark environmental legislation requiring environmental impact assessments (EIS) for all projects with potentially harmful effects on the environment. It is a practice that also became a requirement for development projects throughout Europe in the later 1980s and 1990s (Staeck et al. 2001: 33–42). Such assessments require public consultation and participatory input on the part of citizens—in theory if not always in practice—throughout the research and decision processes. Given the complexity

of such processes, though, it is a strategy that has had to struggle with questions about the relation of citizen involvement and the role of experts in the research and decisions processes.

Environmental Knowledge and the Question of Expertise

Basic to the participatory thrust have been questions about the role of knowledge and those who possess it. To make intelligent decisions both politicians and citizens require a good knowledge of the environmental problems at hand, whether descriptive everyday knowledge or scientifically tested propositions. On the most general level of everyday understandings there have been numerous efforts to supply citizens with information to make intelligent decisions. This has, for example, given rise to "Right-to Know" legislation.

Indeed, the struggle to obtain "Right-to-Know" legislation is generally viewed as an essential component of environmental democracy. Such legislation supplies citizens with ways to obtain information about chemicals dumped in their neighborhoods; what sorts of toxic elements are in the air they are breathing, and so on. As Hazen (1997) puts it: "Right-to-Know programs provide both an opportunity to participate in environmental decision-making and a responsibility to understand and assess the meaning of the data fully." Such programs play an important role in empowering communities to take charge of their own investigations related to decisions affecting their own well-being.

At a more challenging level is the question of the role of environmental expertise in this issue. It is one thing to say that ordinary citizens require knowledge, but it becomes quite another question when we recognize the technical complexity of many environmental issues. Although the environmental movement began with problems that one could smell or see, in the 1970s and beyond environmental policymaking increasing took on a technocratic character as scientific experts began to play a central role in the decision processes. Presenting technical analyses and speaking languages that often intimidate ordinary citizens, this development has become a barrier to environmental democracy.

Environmental Experts and Citizens: Substantive Versus Procedural Logic

There is more here than just a question of who can or gets to participation, as there is an underlying tension between the procedural logic of democracy and the substantive logic of ecology. Related to this barrier to participation is an issue more deeply epistemological in nature. Democracy and ecological science are seen to follow different logics, which at times—at least on their own terms—are irreconcilable. Whereas democracy is about compromise among competing interests and values, scientific expertise generally seeks the best possible answer (or solution), independent of interests. While one seeks to preserve the capacities of the political decision-making structure by discussing issues until all major opposition disappears, the scientific rationality of ecology focuses more on things as they are and the effectiveness of interventions designed to improve or alter them (Diesing 1962). Focusing on green politics, Goodin (1992) has put forth a strong argument underscoring this incompatibility; he points to a sharp distinction between the procedural nature of democracy and the substantive requirements of environmentalism. There is, in short, an underlying tension between the procedural logic of democracy and the substantive logic of ecology. Nature, as Goodin (1992) and others have pointed out, imposes physical and biological imperatives that do not respond to citizen opinion (Goodin 1992). Rigorous understanding of such imperatives is the task of ecological experts. Although citizens can decide how they want to orient themselves to such imperatives, even including ignoring the experts, the ecological system does what it will independently of political decisions. As he has put it, "To advocate democracy is to advocate procedures, to advocate environmentalism is to advocate substantive outcomes: What guarantee can we have that the former procedures will yield the latter sorts of outcome?" (Goodin 1992: 168).

Goodin argues that the tension between environmentalism and democracy—or environmental democracy—arises from a *g*reen theory of value that environmentalists see to take precedence over political institutions. In this view, there is no guarantee that democracy, deliberative or otherwise, will ensure environmental norms and values. A green

theory of political agency, it is argued, cannot be derived from a green theory of value. The main goal of green politics should from Goodin's perspective be the promotion of core green values and the protection of the environment. From these core values a commitment to a particular form of democracy cannot be derived; it is therefore a secondary consideration. About this Goodin is not altogether wrong; the procedures of democracy do not guarantee a commitment to environmental values. For this reason, some say that we need to heed the best expert advice independent of interests and opinions. Other environmentalists, however, take issue with this argument. For them the gap between substantive and procedural values can be bridged through deliberation. Bridging the gap is indeed possible, but again there is no guarantee, as Goodin would argue. It remains one of the challenging questions in environmental political theory.

We can also detect this tension in a much-cited conceptualization of "ecological rationality" put forward by Dryzek (1987). He defines ecological rationality as "the capacity of ecosystems consistently and effectively to provide the good of *human life* support." From this view of ecological rationality "what one is interested in is the capacity of human systems and natural systems in combination to cope with human-induced problems" (1987: 36). Such a conceptualization poses problems for democratic ecological politics as it only refers to the support of human life with no reference to the values of democracy and social justice (Faber 1998). Although Dryzek has long been an advocate of democratic environmentalism, the definition conveys the functional nature of ecology and thus the tension with democratic deliberation. If the ecological system has its own functional imperatives, then they must be recognized and dealt with on their own terms, leaving little to discuss. In this view, humans simply need to adapt. But that adaptation itself is not so simple; not surprisingly, it too involves political choices.

Torgerson goes so far as to see this orientation within green political thought to demand, even guarantee, a "latent authoritarian tendency." It does this by seeking to put the green principle beyond dispute (Torgerson 1999: 126). Or as Smith (2003: 67) explains it, "the contingency and uncertainty inherent in decision making within democratic institutions becomes unacceptable to more fundamentalist greens."

Environmental Democracy as Democratic Political Theory

Environmental participation, it needs to be clear, is not the same as environmental democracy. While participation is necessarily an essential component of environmental democracy, all participation need not be democratic. Environmental democracy, as such, puts the emphasis on democratic participation. But it does this in different ways. Democratic political systems emphasis different forms of participation, two in particular. In general, contemporary democratic political systems refer to forms that emphasize the ability of competing groups in pluralist society to express and advance their interests, or what Dahl (1971) argued are more accurately described as "polyarchies." These interests are generally put forward by the leaders of these groups, who represent their members, groups that are not necessarily democratic. Referred to as forms of representative democracy, it is a conception that generally applies to large political systems; individuals in this understanding are represented through the leaders of the groups of like-minded citizens that they join. In practice, however, this representation can prove to be less than democratic.

The second understanding, more typically described as participatory democracy, represent systems that provide individuals themselves with the opportunity to participate more directly in the decision-making processes. Typically, such systems are associated with smaller systems, even groups. But they can also be located within representative democratic systems. Following these understandings, then, there are two conceptualization of environmental democracy as well. We turn first to the standard pluralist model, taking up the participatory-democratic alternative later in the discussion.

In the group oriented model, environmental democracy refers to a democratic alternative that seeks to include the participation of the interested or concerned groups in environmental policymaking processes. This means politically rejecting extant institutional structures and processes that systematically burden some citizens with environmental risk and degradation without their consent, while extending amenities to others (Mitchell 2006). Hazen (1997), toward this end, writes that environmental democracy reflects the "recognition that environmental issues

must be addressed by all those affected by their outcome, not just by governments and industrial sectors." As such, "it captures the principle of equal rights for all those in the environment debate—including the public, community groups, advocates, industrial leaders, workers, governments, academics and health care professionals."

One could understand these statements to be about conditions for democracy generally as they apply to issues related to environmental decision-making. From this view, environmental decisions require no particular exceptions to the usual requirements for democracy. That is, there are no particular structural or procedural issues related to environmental decisions that are different from those confronted by other types of issues—for example, issues related to high levels of complexity, uncertainty, or the need to decide and act swiftly in matters related to environmental crisis. A widely accepted orientation, it could be understood in terms of interest group competition and bargaining with governmental structures. Little or no attention is given in this view to nonhuman life.

This understanding of environmental democracy focuses on the need to bring environmental values into the processes of political bargaining. That is, in this view, the environmental values can be treated like other competing values. A good illustration of this has been put forward by Paehlke (1995: 131–132), who defines environmental values as embodying "an appreciation of nature in all of its varieties." Asserting that "democracy … must be enhanced effectively to deal with environmental problems," he argues "environmental values must compete with other values" which often conflict with one another. This conceptualization, however, has serious limitations when it comes to rigorous environmental protection, given that environmental values often conflict with entrenched economic values.

Indeed, these conflicts are more or less ensured in political competition in liberal democratic systems. It is clearly reflected in the priority given to individual over common interests. Insofar as the free standing individuals in liberal democratic theory are assumed to pursue their own understandings of the common good, often based on some aggregation of individual self-interests, the approach suffers from an inability to settle or agree on one particular conception of environmental values and common environmental good, or what a sustainable society might look like. Indeed, from

a liberal perspective it is quite acceptable to question the importance of environmental sustainability itself—and some surely do. As atomized political actors, individuals under liberalism have no way (and need no way in liberal theory) to come to an agreement on a common good. In a liberal democratic system there are no substantive environmental criteria or requirements to which citizens must attend. There is, in short, no necessary reason that they have to support environmental issues. And this, in fact, has been a major problem in environmental politics. Many citizens have not supported environmental protection, especially when it comes environmental matters that conflict with economic issues.

Further, this problem can be seen as well in the structure of the liberal bureaucratic state. In the political structure of liberal democracy environmental policymaking—in particular policy design and implementation—is relegated to the environmental policy sphere. That is, it does not extend across all policy spheres (Lafferty and Meadowcroft 1996). An effective environmental policy, however, requires coordination with a wide range of other policy areas, such as economic policy, energy policy, transportation policy and the like, none of which necessarily involve democratic decisions. Such coordination has from the outset been seen as a requirement for a green polity. But it is difficult to extend environmental values, let alone environmental democracy, across a segmented, thinly democratic policymaking system. To confront this problems others have introduced and advanced the idea of deliberative environmental democracy. Drawing on the theory of deliberative democracy in political theory more generally, they seek to bring the otherwise atomized citizens together through processes of collective reason and deliberation in an effort to forge a common good for the environment.

Deliberative Environmental Democracy

Deliberative democratic theorists see the need for more than just competitive interest-oriented participation. As Baber and Bartlett (2005) have written, environmental politics involves "some form of deliberation, some form of collective agreement about how to manage our social relations …." But what form of deliberation remains a subject of much theoretical debate. In their view, as well as that of many others, it should take

the form of deliberative democracy. This leaves the question, though, what form of deliberative democracy? What would it look like; how would it operate? Perhaps the most theoretically rigorous effort in this direction has been the attempt to work out environmental deliberative democracy in terms of Habermas's theory of communicative interaction (Dryzek 1995, 2000; Eckersley 2004). In general, though, there are competing perspectives, all raising difficult questions (Smith 2003).

The emphasis on environmental deliberation resonates with the dominant focus on citizen participation and deliberative democracy more generally in political theory since the early 1990s (Backstrand et al. 2010; Lundmark 1988). Deliberative democracy, as Smith (2003: 53) puts it, "has established itself as a new orthodoxy within contemporary democratic theory" and it is thus "no surprise that it has been the subject of much debate in green political theory".

By and large, deliberation and deliberative democracy have emerged to challenge the belief that citizens are geared only to their own self-interests, a view long influential in rational choice theory in political science (Gutmann and Thompson 2004; Warren 2007). The idea that citizens can engage in moral reason and discussion of the public interest is especially poignant for environmental struggles, as environmental protection for future generations is one of the public interest issues par excellence. Indeed, without such discussion there would be no environmental movement; it is prima facie evidence for this public interest.

For the theorists of deliberative environmental democracy deliberation focuses on discussion and debate oriented to generating reasoned opinions in which citizens are willing to alter their environmental preferences in view of new information and arguments offered by fellow citizens (Gundersen 1995). Citizens engaged in environmental deliberation, in this perspective, still have their own interests but they are expected to advance reasons as to why they take their environmental views to be in the interest of the other participants as well, including those not yet born. (Fischer 2009). It is a perspective that has been embraced by environmental political theorists such as Smith (2003), Dryzek (2000), Baber and Bartlett (2005), (2001), Fischer (2000) and Dobson (2003). These writers have advanced a concept of deliberative environmental democracy that seeks to bring environmental politics in close contact with the theory of deliberative democracy, including rigorous efforts to formally integrate them.

From the perspective of deliberative environmental democracy traditional liberalism implicitly rests on a restricted conception of reason largely influenced by the dominance of scientific rationality. In this way, as is often seen in environmental deliberation, that which counts as legitimate argumentation is problematically narrowed from the outset. The point is particularly important in environmental politics given the importance of scientific information and the technocratic forms of expertise that often dominate environmental policymaking (see Lidskog and Sundqvist, this volume).

Often neglected in environmental politics are the distinctive viewpoints of groups at the margins of the dominant culture, in particular those who employ other modes of reason and expression. This becomes especially important in the context of global environmental politics, where other cultures come into play, (including indigenous groups in the developing world), a topic often related to debates on environmental justice (see Roberts et al., this volume). It is an argument that eco-feminist theorists have also leveled against neo-positivist modes of science and reason (as well as against some deliberative theorists who emphasize particular modes of "rational" reason). Environmental democratic theorists thus call for a more open, democratically inclusive approach to discourse and deliberation. It is an position particularly pertinent to environmental struggles, especially as they pertain to issues that raise questions about the nature of reason and argumentation. Much of environmental theorizing, in fact, has placed a good part of the blame for the crisis on a distorted mode of technical reason associated with the industrial revolution and the developmental path to which it gave rise.

The question involves the role of the individual citizen in environmental political decisions. Given that from the perspective of liberal theory free standing individuals are assumed to pursue their own understandings of the common good, often based on some aggregation of individual self-interests, the approach suffers from an inability to settle or agree on one particular conception of "the" environmental good, or what a sustainable society might look like. Indeed, from a liberal perspective it is quite acceptable to question the importance of environmental sustainability itself—and some surely do. As atomized political actors, individuals

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Environmental Citizenship in Environmental Democratic Theory

Others say that deliberative democracy does not go far enough. Radical environmentalists—or "fundmentalists" as they are often called—fault other environmental democrats for relying on a liberal understanding of politics, albeit a progressive version of it. For them, an attempt to reform existing political-economic systems will fall far short of sustainability. Among the reasons for this limitation is the fact these political economies are devoted to the ideology of consumerism, which is a root cause of overproduction and material waste driving the environmental crisis. Such a politics is also seen to proceed too incrementally in the time still available for avoiding a serious crisis, if not catastrophe. Indeed, radical fundamentalists argue that an approach to environmental democracy that relies on reforming the structures of unrepresentive liberal-capitalist systems will contribute—unwittingly—to a politics of *un*sustainability.

Deliberative democratic politics carried on within the framework of a capitalist system and the political culture that supports it, radical environmental democrats argue, will thus never represent genuine democracy. For them, environmental democracy has to be founded on a darker conceptualization of green situated at the very core of the political system. Rather than understanding environmental policy as one policy realm among others, more radical greens insist that all policy areas need to be consistent with core ecological principles of sustainability (Porritt 1986).

One of the ways of ensuring that the substantive principles of ecological sustainability inform the core processes of political decision-making generally is, in this view, through a new ecological consciousness grounded in a strong concept of environmental citizenship. Such an understanding of environmental citizenship, as a core governing principle, is based first and foremost on acknowledging ecological obligations and responsibilities that extend across generations and national boundaries to the global sphere (Dobson 2003). Some would also add a responsibility to nonhumans. In this view, a safe and sustainable environment has to be adopted and accepted as a human right for all citizens across the planet. Environmental citizens become, according to van Steenbergen (1994), "earth citizens." Rather than the vertical link between citizens and the nation-state under liberal representative democracy, this conception of environmental citizenship can be understood in terms of a horizontal relationship between citizens across the planet (Dobson 2003).

Both environmental deliberative democracy and environmental citizen are for the most part more matters of environmental political theory than real-world political realities. But there are other approaches that can be more readily discovered in the realm of environmental politics. That is, not just in the realm of theory. In this regard, we can explore two such political activities, one being insurgent environmental democracy and the other being participatory eco-localism, including the ecovillage movement in particular.

Insurgent Democracy in Environmental Democratic Theory

Sometimes calls for environmental democracy serve as a guide to direct environmental political action. Indeed, much of what happens in the name of environmental democracy, including calls for environmental citizenship and deliberation, plays out as a normative appeal in the practical realm of environmental political struggles. Here the demands of those burdened by environmental pollution and various form of degredation are advanced in the streets by civil society movements. And as such,

it conforms with the alternative understanding of democracy put forward by Wolin (1994, 2008) and Ranciere (2015), or what is called "insurgent democracy." While it is a theoretical concept, it is based more on understandings and observations of actual contemporary political struggles. In this view, insurgent environmental politics corresponds to what they refer to as the essence of democratic politics throughout history. Instead of focusing on democracy in terms of political institutions, democracy should never be understood as a fixed political form or location. Rather it is a call for action to stand up against unjust governmental practices. In this regard, democratic engagement is throughout history properly understood in terms of political experiences involving ordinary citizens in their roles as political actors outside of formal government.

In this understanding democratic politics does not happen very often because it is generally discouraged by poweful elites. But insurgent democratic uprisings can break out at any time, anywhere. Breaking with the dominant consensus, such vocal disagreements and the demands they advance are seen as the essence of democracy throughout history. Never fully realized, democracy is an ongoing struggles rather than institutional arrangements. Always about struggles that are evolving, democracy, so understood, is a process of becoming. Democratic moments are thus episodic, unstable and often temporary. In the views of Wolin and Ranciere, processes of institutionalization often in fact signal the attenuation and cooptation of democratic struggle. In the institutional stage, hierarchies emerge and expertise is drawn to the decision-making processes in the names of order and procedure. In this process, radical claims are filed down and softened, as the revolutionary or progressive democratic movements that mark political history fade away. It is a theoretical understanding of democracy that many who focus on democratic institutional practices—or the lack of them—do not necessarily accept. But it offers a relatively good explanation of the real-world politics associated with the call for environmental democracy. There is, however, an alternative organizational perspective, the eco-commune and the ecovillage in particular, devoted to the practices of participatory environmental democracy. We turn at this point to an outline of this eco-local alternative in the next section.

Environmental Democracy and Eco-Localism: Human Scale and Decentralized Eco-Communities

Also, unlike deliberative democracy, the environmental movement refers to ongoing practices that involve many who would consider themselves to be environmental citizens. These have to do with a burgeoning eco-local movement, which includes a wide spectrum of intentional communities—from eco-communes, Kibbutzum, co-housing, transition town initiatives, and ecovillages (De Young and Prinsen 2012; Nobert-Hodge 2014). It is a movement that has roots, theoretical and practical, in an earlier phase of the environmental movement.

In the 1960s and 1970s, a good number of environmental theorists, especially radical theorists, rejected the national state altogether—as an unsustainable unit of governance—and put the emphasis on decentralized forms of community life. Although this perspective tended to fade in later decades, when the emphasis was placed on globalization, it has more recently remerged, especially as many become skeptical about the ability of global environmental agreements to arise to the occasion.

Typically, the current movement, like the older one, emphasizes a return to the local, in particular decentralized eco-communities and bioregions based on a human scale (Sale 1980). While much of the emphasis has been on lowering the ecological footprint, there has also been an important participatory strain running through the movement. Indeed, like the earlier writings of Sale and Bookchin, these eco-localists point to decentralization as the ideal condition for participatory democratic governance. This is founded on the recognition that authentic democracy depends on face-to-face communication about things close to the lives of the affected citizens. Large political systems, as is well established, make decisions removed from their citizens. In these systems, citizens do not speak for themselves; they have to depend instead on someone else to do it for them. Without this human, interpersonal dimension, as Sale argues, genuine democracy is beyond reach.

Like other theorists of environmental democracy Morrison (1995), argues that the theory and practice of environmental democracy must be constructed around three independent pillars: democracy, balance, and

harmony." As "an expression of an ascendant civil society," environmental democracy is "decentralist, flexible, and devolutionary …." It is conservative, he argues, in that it rests upon a revitalization of fundamental democratic values; it is radical in that it seeks the transformation of the industrial imperatives of production and consumption, profit and power. Pointing to cooperatives such as Mondragon in Spain, Morrison calls attention to the importance of earlier writers such as Bookchin and his theory of libertarian municipalism.

Bookchin, one of the leading environmental social theorists in earlier decades, developed a vision of an elaborate system of confederated ecological communes organized around what he called "libertarian municipalism," essentially a theoretical program for environmental participatory democracy. The basic idea is to root power in decentralized community organizations through the establishment of "popular assemblies." Bookchin sought to restructure local governing bodies by turning their institutional arrangements into popular democratic assemblies organized around neighborhoods, villages and towns. Citizens in such popular assemblies democratically engage in decision-making through direct face to face discussion and deliberation. Beyond establishing these municipal assemblies, the final organizational step in his political program involves a "confederation" linking together these democratic municipal bodies (Bookchin 2015: 67–82; Bookchin 1992; Bookchin Bookchin 1992, 2015: 67–82; Bookchin and Biehl 1997).

In various way, the contemporary ecovillage movement, grounded in existing practices as well as theory, can be seen as a contemporary manifestation of such ideas (Fischer 2017). Basic to the ecovillage is the participatory practice of consensus decision-making (Litfin 2013; Parr 2009). As perhaps the most progressive model of environmental democracy, the ecology village movement has emerged as a worldwide phenomena. While most are located in rural areas, there are also urban ecovillages (Fischer 2017).

Although consensus-based environmental democracy is time consuming, it is seen to lead to leads to just and informed decisions that, after being made, are more easily and effectively implemented. By giving all members the opportunity to think through and voice their concerns, otherwise hidden issues come to the surface and addresses in advance of concerns that can later come up and be problematic (Kunze 2003).

Nonhuman Life in Environmental Democracy

Often radical environmental democrats also seek to extend political representation to nonhuman life in the ecological system, from animals to trees (Duvall and Session 1985). Although this idea strikes some as something between misbegotten and absurd, it has in fact involved court cases that have ruled in favor of nonhuman entities. For the supporters of this understanding of environmental democracy, often concerned with biodiversity and animal rights, there is a need to rewrite the understandings and relevant rules of governing law and humanity (Shiva 2005). While this perspective would go a long way toward protection of the ecological system, it nonetheless raises complicated questions in democratic theory that remain unanswered.

For most environmental democrats this means that humans must serve as proxies for the natural world and represent it in the processes of environmental deliberation. But others such as Disch (2016) and Latour (2004) have turned to less known conventional orientations such as actor-network theory in an effort to include nonhumans on their own terms. In this approach nonhuman beings, like humans, can be seen to possess a politics in the sense of having agency. This "material participation" is focused on the "capabilities and capacities of nonhuman things to facilitate, educate and influence citizenship and political engagement."

As Disch (2016: 626) argues, this "object-oriented" approach to democratic practice "recasts non-humans from mute (and potentially injured) objects in need of human advocates to mediators of environmentally responsible action in their own right." Rather than attributing human-like characteristics to material objects, it offers a methodological research principle that can "render visible the active participation of things as varied as facts and theories, plants and microbes, machines and institutions in composing society and social relations." (628). This means that it is action rather than verbal communication that connects humans and nonhuman actors. While the approach is scarcely shared by all environmental political theorists, it does potentially pose a serious challenge to more conventional understandings of environmental democracy, especially

deliberative environmental democracy. While this is not the place to go into a detailed exploration of actor-network theory, one can concede that this form of co-participation offers an interesting way of breaking down the boundary between humans and nonhumans, and at the same time, provides an alternative understanding that deals with some of the barriers that separate the logics ecology and democracy, and thus an adequate theory of environmental democracy (Carolan 2006).

Conclusion

In this chapter we have examined the basic foundations of environmental democracy, including the more radical participatory variant. Toward this end, we have noted its foundations in the long-standing call for citizen participation in environmental struggles, its relationship to environmental justice (see Roberts et al., this volume), its manifestation in various legislative initiatives such as environmental impact statements and right-to-know laws. We also briefly pointed to various themes in the radical environmental movement, insurgent environmental politics, the existence and practices of the global ecovillage movement and the need for an understanding of an alternative political form of representation for the nonhuman elements of the environment.

Although present day political practices remain far removed from the principles and norms of environmental democracy, it is quite likely that it will remain an important normative concept in future struggles. As the environmental crisis worsens, especially the climate crisis, there are already calls for forms of eco-authoritarianism that view democracy as the problem rather than the answer when it comes to sustainability, if not survival (Fischer 2017). Indeed, such views are frequently associated with powerful scientific, economic and political leaders. Thus, given that citizens will continue to press for involvement in the environmental decision processes, resisting such authoritarian tendencies, the call for environmental democracy—in one form or another—will without doubt continue to be an important political commitment for environmentalists in the struggles ahead.

Notes

1. The discussion elaborates on ideas and arguments developed in *Climate Crisis and the Democratic Prospect* (Fischer 2017).

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13

Joining People with Things. The Commons and Environmental Sociology

Luigi Pellizzoni

Introduction

The theme of the commons has been debated for decades. In recent years it has intensified and broadened in scope, taking an increasing sense of urgency. A number of meanings and outlooks has stratified, often blurring analytical and normative purposes. Addressing comprehensively the issue in the space of a chapter is impossible. In what follows basic questions and approaches are discussed from an environmental sociology perspective.

In the first section I deal with the origins of the current debate, marked by Garret Hardin's seminal article and Elinor Ostrom's path-breaking research. The two thinkers agree on regarding the commons as socio-material assemblages, while disagreeing about their durability. In the following section the perspective broadens to include discussions associated with the global order and its crisis, where the notion of 'commoning', the

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social process of establishing or recognizing something in common, gains relevance. Subsequently I address the issue of the new commons, as directly or indirectly related with knowledge, the production and management of which raises both novel opportunities and challenges, as the entangled issues of biotechnology and the 'sharing economy' testify. Then I review the question of old and new enclosures, the latter sometimes taking subtler and deeper forms than the allocation of property rights, and deal with debates over the commons from a legal viewpoint, as inspired by different traditions and pointing to different solutions. The last section suggests that the human-nonhuman connection aspect is crucial to the commons, yet it has to be considered in the context of current processes of value extraction.

The Commons: From Tragedy to Comedy

The question of the commons is as old as humans' attempts to regulate access to and management of land. However, current debates have a definite starting point: the publication in 1968, in the journal *Science*, of an article of the biologist Garret Hardin, entitled 'The Tragedy of the Commons' (Hardin 1968).

Hardin's argument is that, if access to a natural resource—say a field—is open, so that everyone can take something out (for example pasture) or put something in (for example waste), then, since everyone has an interest in using it without incurring the costs of its maintenance, such resource is bound to become damaged and eventually destroyed. The 'tragedy' is avoided only if something (wars, human or animal diseases etc.) keeps the use of the resource within its carrying capacity, or if access becomes regulated. According to Hardin, regulatory options boil down to either state control or private property.

The commons, therefore, are for Hardin resources both easily accessible and prone to exhaustion. What counts, however, is not just their physical features, but the meeting of such features with human groups. Commons are things provided with certain characteristics, utilized by human collectives in certain ways and for certain purposes. With a terminology borrowed from science and technology studies, we can think of them as peculiar socio-material assemblages. Assemblages, moreover, are

not static but change over time. In his article Hardin is concerned with the problem of overpopulation. The phenomenon, we can reflect, is a result of the combination of social, cultural, scientific and technical factors. The same can be said for pollution and many other environmental problems. In other words, leaving aside geological events independent of human action, tragedies of the commons are connected with social arrangements and social change.

It has become standard to distinguish the commons from other use regimes of resources according to two factors: excludability of users (the capacity to prevent someone from having access to a resource) and rivalry between users (the extent to which one person's use reduces availability for other users). Commons are non-excludable and rivalrous. Private property, or state regulation, makes a rivalrous good excludable. There are goods, like bridges or cinemas, which are excludable but non-rivalrous (at least to a point). These are called toll, or club, goods. Finally, some goods are public, not in the sense that they are state owned, but that they are neither excludable nor rivalrous. Think of air, mountain trails or the national defence system. Change in use conditions, however, may transform public goods into commons. Clean air becomes scarce for pedestrians in city streets jammed with traffic, and mass tourism makes rivalrous the use of mountain trails. Moreover, one thing is use, another is production. The defence system can be enjoyed in a non-rivalrous way by everyone, but incurs costs of institution and maintenance that citizens hold through taxpaying, hence according to wealth.

As said, Hardin is concerned with the problem of overpopulation. The year of his article is the same of Paul Ehrlich's book *The Population Bomb*, and close to other publications of wide resonance (from Barry Commoner's *The Closing Circle*, 1971, to the MIT report *The Limits to Growth*, 1972) that challenged the received wisdom by portraying environmental problems as global and systemic, rather than local and accidental, and the exhaustion of resources as a pending, rather than remote, threat. From this perspective, the rise of the theme of the commons is another testimony of concerns that begin to emerge at that time.

The greatest merit of Hardin's article is that it kick-started a new field of research which has blossomed in a variety of disciplines—first and foremost institutional economy, where the leading figure is Elinor

Ostrom.[1] Theoretically, Ostrom (1990) takes distance from Hardin's rational choice framework, which assumes that individuals are moved only by selfish motivations and do not exchange information. Actually, even from a rational choice perspective, the possibility, and indeed the probability, of communication and recognition of shared interests is admitted. The success enjoyed by Hardin's assumptions, we can submit, is not only due to their simplicity but also to their affinity with the paradigm of proprietary individualism—the idea of property as a basic individual right (of use and abuse, that is, including damage and destruction)—theorized by seventeenth century thinkers, such as John Locke, and adopted by modern legislation.

Thanks to a number of in-depth studies, Ostrom and collaborators have shown that commons do not necessarily lead to tragedy. On the contrary, they can work effectively and for a long time. Commons survive everywhere, not only in the global South but also in the North—even if usually as relics of premodern collective properties or use rights (collecting of firewood, pasturage etc.) over state or privately owned land. And, as we shall see, new commons emerge, challenging the aura of conservatism that often surrounds the notion. In short, tragedy can turn to comedy.[2] Common-pool resources can be successfully managed by a community without recourse to privatization or state control, but by setting appropriate rules. 'Appropriate' means suited to the situation, as it evolves over time. Some design principles, however, can be distilled from successful experiences: from a clear definition of the content of the resource to the possibility of excluding untitled parties; from community members' participation in decision-making to effective systems of self-monitoring and sanctioning. Additional help comes from the presence of dense social networks and stability of, or moderate rates of change in, both the material and the social features (climatic, demographic, technological etc.) of the commons (Ostrom 1990; Dietz et al. 2003).

Research has helped to refine the conceptual equipment. For example, the notion of property has been unpacked. A bundle of rights can be associated with resources: access (the right to enter a given physical property), withdrawal (the right to the 'products' of a resource, for example to catch fish), management (the right to regulate use modalities and to modify a resource to 'improve' it), exclusion (the right to assign access rights and

define how these may be transferred), alienation (the right to sell or lease the rights of management and exclusion) (Schlager and Ostrom 1992: 250–251). The full owner is the subject who holds all of them, as distinct for example from authorized claimants, who hold only the first three rights, or authorized users, who cannot assume management decisions. Another important distinction is between *Open Access* regimes, those considered by Hardin and characterizing global commons like the atmosphere, the electromagnetic spectrum, space, the open seas or biodiversity, and *common property* regimes—by far the typical situation for local commons (i.e. well-circumscribed socio-material assemblages).[3] Moreover, common property *regimes* have not to be confused with (and do not always involve) common-pool *resources* (Ostrom 2000; Hess and Ostrom 2007).

Commons or Commoning?

Though its relevance is widely recognized, Ostrom's approach has been criticized, especially in recent years, for what is considered its ambivalent relationship, partly critical but partly compatible and even functional, with a global order in which plunder proceeds at a growing pace; an order defined by the post-Fordist reorganization of capitalism and the neoliberal restructuring of the state (Caffentzis 2012; Haiven 2016).

Neoliberalism and post-Fordism are contested notions. Many prefer to talk of globalization or network governance, which however are no less contested concepts. Be that as it may, there is robust evidence of major, worldwide institutional changes that have occurred in the last decades (Baccaro and Howell 2011). Their rationale resides in an understanding of humans as entrepreneurial, competitive beings; an account of the market as the only institution capable of processing information effectively; and a view of state regulation as instrumental to the dissemination and strengthening of competition and market rationality in any social field (Mirowski 2013). Crucial to this rearrangement, which takes to the extreme the logic of proprietary individualism, are the social relations with the biophysical realm, which are restructured through (often technology-enabled) enclosure, commodification and marketization (Harvey 2003; Castree 2008).

By any evidence these changes have increased social inequality and systems instability. In this context the debate on the commons has broadened in scope, compared with the original 'managerial' perspective. For Ostrom 'a commons is not value laden—its outcome can be good or bad, sustainable or not' (Hess and Ostrom 2007: 14). Institutions for the commons can be nested in complex governance arrangements employing mixtures of hierarchy, market and community self-governance.[4] Ostrom's claim, therefore, is not that the commons are alternative to state and market, but that they can prosper beside other types of regulation, sometimes replying to their failures—the latter being understood as localized, not systemic. This approach does not change when immaterial, or knowledge, commons are addressed (Hess and Ostrom 2007). Discussions about the global social order and its drawbacks have precipitated significant shifts in the commons debates, with two additional notions gaining salience: namely, 'common good' and the 'common' (singular). With these notions the assemblage character of the commons gets somewhat unbalanced: the social takes prevalence over the material.

'Common good' is an ethical-political notion. It designates the basic reasons or goals that hold together a community; what is deemed right and desirable for it; the general interest emerging from a political collective. The relation between commons and common good resides in the fact that a use regime cannot be decided purely on efficiency criteria. These usually take for granted a given distribution of power and agency, legitimized on a variety of grounds (from gender to ancestry, to the right of occupation). Critics of the 'managerial' approach stress how it considers only endogenous variables (think of the design principles hinted above), neglecting their framing conditions (Caffentzis 2012). Moreover, efficiency criteria build on given assumptions concerning success and failure. For example, in the *Second Treatise on Government*, Locke remarks that 'the wild Indian' who is 'still a tenant in common', can be 'a king of a large and fruitful territory' and yet 'feeds, lodges, and is clad worse than a day-labourer in England' (Locke 1823[1689]: 116, 122). One can argue, however, that Locke and the wild Indian had different views about what makes a person wealthy and a life worthy of living, or what is sound for nature or other people. A direct comparison of their approaches in terms of efficiency, therefore, is spurious.

The contestability of any claim about the common good warns against overly romantic views of the commons. Many accounts (see also below) seem to reproduce the narrative of loss and (im)possible recovery that dominates the modern discourse about community (Delanty 2003). As Ostrom has shown, to work effectively commons have to circumscribe the range of users, so inclusiveness and participation implies exclusiveness and marginalization. The commons are often assumed as 'inherently equitable, egalitarian, open and participatory', yet they may entail 'racism, sexism, ablism, colonialism and other systems of oppression' (Haiven 2016: 263).

As for the 'common', this concept has become fashionable especially in post-Marxist literature. According to Hardt and Negri (2009), common means not only 'the common wealth of the material world—the air, the water, the fruits of the soil, and all nature's bounty', but '*also and more significantly* those results of social production that are necessary for social interaction and further production, such as knowledges, languages, codes, information, affects, and so forth' (p. viii, emphasis added). Similarly, according to Dardot and Laval (2014), the common is a principle, on which political obligations and the search for the common good are grounded, and not a thing, a substance or a quality of something. Thus, even more than with the common good, the notion of common gives human agency precedence over materiality. What counts first and foremost is not how a biophysical entity or a process manifests itself to humans when they approach it, but humans' 'commoning', their act of establishing or recognizing something in common. From this perspective, therefore, human collectives can partition, assemble and handle virtually anything (land, forests, water basins, the sea, organisms, genetic information and so on), as long as they so decide and technical and organizational means allow. From a commons perspective, instead, entities and processes have, so to say, their own 'rules', which, as far as they are apprehended, it is sensible and appropriate to comply with.

The conceptual shift from the commons as socio-material assemblages to commoning as a social process, whatever its theoretical justifications, is elicited by the growing relevance of the immaterial (knowledge, information) in the current economy—as Hardt and Negri's definition shows. If Marx talked of 'general intellect' to refer to the technical-scien-

tific expertise and social cognition objectified in fixed capital, post-Marxist thinkers stress how 'cognitive capitalism' transfers the general intellect from machines to humans' linguistic, communicative abilities, their capacity for learning and cooperation, their creativity, affectivity and ethical commitments (Virno 2004; Vercellone 2007). These capacities, it is claimed, are formed outside production processes: capital has neither the possibility nor an interest in their full internalization, since this would undermine the generation of surplus value. The open, informal spaces of the 'smart' factory, where workers are free to move, gather, discuss or reflect on their own, emblematize the distance of new capitalism from the old productive model. This, however, provides room for enacting post-capitalist relations and orienting innovation accordingly. Thus, cognitive workers' commoning is simultaneously central to capital accumulation and to the possibility of radical change. This, as we shall see, makes controversial the import of many so-called 'new commons', as directly or indirectly related to the intensification of knowledge production and information exchange in the digital era.

The New Commons: Knowledge and Materiality

Hess and Ostrom (2007) note that a consideration of knowledge (ideas, creative work, information and data) as a commons emerges suddenly around 1995. Knowledge was traditionally considered a good of limited excludability and above all non-rivalrous—and cumulative: benefits grow together with use. No doubt, things have always been more complicated. Political power has always had an interest in controlling information, precisely for its cumulative character. Moreover, a book can be privately owned; a subscription fee makes a newspaper a toll good; a library is a common-pool resource. However, the 'digital revolution' has intensified to an unprecedented extent the commodity aspect of knowledge, hence the interest in creating scarcity—for example by expanding intellectual property rights (IPRs). By reference to the enclosures of natural commons that centuries ago kick-started capitalism (see next section), someone

talks in this regard of a 'second enclosure movement' (Boyle 2003), which may even lead to a 'tragedy of the anticommons' (Heller and Eisenberg 1998), when IPRs excessively restrict access to knowledge, hampering innovation.

It is useful here to reflect on how the expanding role of knowledge as an economic resource impinges not only on the production and management of knowledge itself but on knowledge-mediated relationships with the material world, leading to new commons and new enclosures. Two examples are biotechnology patents and biobanks.

The fundamental feature of biotechnology is the combination of biology and informatics (Thacker 2007). 'Life' becomes simultaneously matter and information, thingness and cognition, presence and pattern, 'wet' and 'dry', real and virtual, moving fluidly from living cells to test tube, to digital databases. This dual ontology underpins the extension of the patents system, previously restricted to human artefacts, to the living world. By regarding a living entity as an artefact if its basic functional parameters can be controlled (thus reproduced), patents establish a correspondence between information and matter, so that rights in property over information can be subsumed into rights in property over the organisms incorporating such information, and vice versa (Calvert 2007). Among the other things, this has enabled 'biopiracy'—the practice whereby biodiversity and related knowledge shared by local communities is privatized without any substantial innovation, permission from and little or no compensation or recognition to local people themselves.

As for biobanks—broad, systematic collections of human biological materials—they testify how biotechnology elicits new forms of 'biosociality' (Rose and Novas 2005). What is put in common, in this case, is elements of people's bodies—and lives: participation in biobanks may include compliance with medical regimes of dosing, testing, self-monitoring and so on. Participation is usually presented and perceived as a way of contributing to the common good: an act of altruism, a 'gift to strangers' similar to blood donation. Yet, since biobanks provide data to the pharmaceutical industry, it is also a means of value production. The common good is connected with the development of commodities, such as drugs and diagnostic tools.

Biobanks can be seen as an example of 'sharing economy'—a buzzword of recent years, especially after the 2008 economic crisis. Sharing economy is an umbrella term that covers different goods (material or immaterial), purposes and entitlements (production, use, ownership, access), and reasons for sharing (economic interests, value commitments). In some cases we are fully within the market logic: novelty pertains only to how offer and demand meet thanks to digital platforms. In other cases something—or a lot—more is at stake. Pais and Provasi (2015), for instance, distinguish between collaboration, reciprocity and common-pool arrangements. Collaboration is closest to market transactions, except that relations of production and consumption are not fully captured by a contract. Trust, often based on reputation, is central, though the motivation remains instrumental. Examples we may think of are car pooling or ride sharing, social dining (parties prepared by non-professional chefs in their own homes), energy communities (consumers as also owners of power plants) and reward-based crowdfunding. Reciprocity follows the logic of the economy of gift, where exchange is not based on agreement for immediate or future rewards, though reciprocation is usually expected. It entails a degree of unconditional cooperation, hence of non-instrumental motivation. The goods exchanged have also a relational value. Examples are donation-based crowdfunding, time banks (exchange of services according to an hour-for-an-hour system), complementary local currencies, solidarity purchase groups (consumers cooperating to buy goods at a fair price directly from producers or retailers) and community supported agriculture (growers and consumers sharing the risks and benefits of food production from local farms). Common-pool arrangements are communitarian in structure. Exchange occurs between people tied together by a sense of belonging, a motivational investment leading to identification with the group. Reciprocity is fully unconditional (no expectation of reciprocation) and, within the group, generalized (regardless of personal acquaintance and gratitude). This case is typical of traditional communities but not restricted to these. Open access/source/design/manufacturing movements often show these traits. Moreover, initiatives outwardly similar may differ or evolve significantly, from collaboration to reciprocity or common-pool arrangements. For example, energy communities may expand from individual to shared

benefits (creating workplaces or other services, such as a kindergarten, thanks to the revenues from selling energy, etc.), and a strong sense of identity may develop around energy independence or environmental protection (Walker and Devine-Wright 2008). The same evolution may characterize solidarity purchase groups and community supported agriculture, or urban gardening.

This variety of situations makes sharing economy a conceptual swamp. Sharing and cooperation may offer brilliant examples of commoning, but represent also a template for new business models and a fertile terrain for accumulation (Brabham 2013; Söderberg and Delfanti 2015). Actually, 'commons fixes' (De Angelis 2013) seem increasingly considered crucial, at the political and business levels, to dealing with economic decline and devastation of social and environmental reproduction without engendering any actual systems change. Hence governments' enthusiasm for 'community empowerment' programs whereby welfare state responsibilities are off-loaded onto community-based and not-for-profit groups to reduce government expenditure. And hence corporate commodification of the results of collaborative work, from the inclusion of free software or open hardware into proprietary products to the valorization of barter networks or community gardening in 'urban regeneration' plans. Capital, it has been said, is becoming increasingly 'communist' (Virno 2004), mobilizing for its own benefit material and cultural conditions that, in principle, contradict its proprietary rationale. From this perspective, the 'rental' logic spreading in a variety of sectors (from cloud computing to photocopy or car services) shows how commoning can be perfectly suited to perpetuating and even expanding marketization and commodification.

Enclosing the World

If the commons do not necessarily lead to tragedy, there is little doubt that their marginalization is due to the worldwide diffusion of the modern state and market capitalism. The key historical event is that of the 'enclosures'—the fencing and entitling to private owners of portions of land previously open to local communities. The process began in England, where it was prominent especially between the seventeenth

and the nineteenth century, but with different timings it characterized also mainland Europe. Outside Europe enclosures are a result first of colonization processes, then, with decolonization, of state and economy 'modernization' programs. For Marx, Polanyi and many others, by enabling a first accumulation and 'liberating' labour force for the insurgent industrialization, enclosures are crucial to the rise of capitalism. Cultural change is no less important. Modern thinking inverts the relationship between private and common property. Traditionally, the former was subordinated to the latter. Thomas Aquinas (c. 1300) claimed that everything originally belongs to everyone (and not to no one!).[5] A thousand and three hundred years earlier, in Rome, Cicero was of a similar opinion. Locke actually acknowledges this, but only to add that 'there must of necessity be a means to appropriate [things] before they can be of any use, or at all beneficial, to any particular men' (1823[1689]: 116). Moreover, he stresses, if nature gains value through the application of human labour, conferring exclusive control of the outcomes of such labour to those who have worked is both morally right and collectively beneficial, because of the increased yield this work ensures. For these reasons individual property has priority. Locke, however, specifies: 'at least where there is enough, and as good left in common for others' (1823[1689]: 116). This and other passages show how he frames the primacy of private property in a context of abundance of land and resources, like that of the colonization of America—a far cry from the present situation.

Enclosures are historically recurrent processes (Harvey 2003; De Angelis 2007). They occur any time mechanisms of separation and commodification are applied to any type of resource, biophysical and cultural, natural and artefactual, material and immaterial. Examples abound around us. One is land grabbing: domestic and foreign corporate (or state) large-scale buying or leasing of land and water, especially in Africa, Asia and South-America.[6] Also the replacement of polyculture with monoculture, promoted by agriculture 'modernization' programs, can be considered an enclosure, to the extent that it undermines farming integration with the environment, increasing farmers' dependence on seed companies and susceptibility of crops to diseases or adverse climate conditions. Think, moreover, of ecosystem services: the benefits biophysical systems provide to

humans.[7] It is true that they show the relevance of 'self-organizing dynamics and regenerative social-ecological capacities outside of the direct production processes' (Nelson 2014: 462). However, the very expression 'ecosystem services' conveys the idea of a full acquisition of nature to a logic of economic efficiency and valorization (Robertson 2012). Emblematic in this sense is the conclusion of a corporate-funded study, for which 'green infrastructures' (defined as planned and managed natural and semi-natural systems involving water, air and land use) can provide significant benefits to firms compared with traditional gray infrastructures, including reduction of initial and ongoing expenses, increased energy efficiency and effective management of socio-political risk through innovative collaboration with key stakeholders (The Nature Conservancy 2013).

Consider also how biotechnologies enable enclosure in forms that are both subtler and deeper than the allocation of property rights. According to Boyd et al. (2001), Marx's distinction between formal and real subsumption of labour can be used to distinguish between formal subsumption of nature, occurring when capital exploits natural resources by adjusting to their own features (as with mineral, oil or coal extraction and the inanimate world in general), and real subsumption, which occurs when the living world is '(re)made to work harder, faster and better' (p. 564) in order to enhance accumulation.[8] Of course, interventions in the biological realm are as old as agriculture, and biotech corporations insist that what they do is just what humans did for thousands of years, only more competently and precisely. Yet, this claim obscures how the blurring of the physical and the informational—a crucial feature of biotechnologies, as we have seen—embeds in the material the limitlessness and plasticity of the immaterial, disclosing a horizon of infinite value extraction which was alien to any previous approach to the transformation of the living world. Moreover, the distinction between living and non-living is increasingly questioned in a number of fields, from biology to chemistry and cybernetics (Pellizzoni 2016), and both are simultaneously put to work to enhance productivity, for example with new mining techniques that utilize microorganisms (Labban 2014). This suggests that real subsumption is not limited anymore to the living world. Today literally anything can be enclosed, disassembled and reassembled in novel configurations to make it (more) suitable to commodification.

In short, capital increasingly remakes nature in its own image. Western culture's ambivalence about nature, simultaneously seen as encompassing and external to the human, is resolved not in the direction of conceiving of human-nonhuman relationship as a gathering on equal footing, as many non-western cultures do and as implied in the assemblage conception of the commons, but of a complete loss of autonomy and distinction of the natural.[9] Nature becomes an internal differentiation of the social (in its capitalist apprehension). This is perhaps the most dramatic enclosure of all, also because it possibly extends to humans' own mindset and imagination. Cognitive workers, no matter how autonomous and creative, do not operate in a social void, but in a context dominated by prescriptive cultural and organizational models of fulfilment, achievement and reward (Dardot and Laval 2014; Haiven 2016). This may at least partially explain why 'revolutionary' innovators align so often and so quickly with the imperative of profit—why, for example, hackers accept to be hired by those corporate and state organizations against which they had originally mobilized (Söderberg and Delfanti 2015).

It must be added, however, that the supremacy of the immaterial over the material, or the latter's acquisition of the former's features (boundless plasticity and limitless value extraction), can be more illusory than it seems, for at least four reasons. First, knowledge is produced and used by human beings, who have bodies that even in futuristic cyborg versions require maintenance. Second, there are physical limits to the speed of information flows, which are being approached (it is impossible to go quicker than light and the miniaturization of chips cannot proceed indefinitely because below a threshold of some nanometres quantum effects hamper the control of the electric charge). Third, to produce, exchange and store knowledge huge amounts of material, space and energy are consumed (think of Google's data centers) and waste produced (electronic pollution is a most serious issue, especially in developing countries). Fourth, as Marx's famous formula of capital (M-C-M') indicates, and financial crises confirm, the production of value always needs a passage through materiality—the Earth is the ultimate source of any wealth.[10]

The Right to the Commons

The debate over the commons has also an important legal side, which, not surprisingly, has intensified together with the worsening of the global crisis. Roughly, one can distinguish a 'medievalist' outlook from a 'Romanist' one. The former considers Roman law, which is the basis of modern codifications, the source of the idea of private property as an individual right (Mattei and Capra 2015). It therefore gives relevance to different traditions, from 'collectivist' institutions like the German *Marke* or the Russian *obščina*, which entailed common properties or use rights over land, pastures and forests, to early written legislation on the commons, especially the English *Charter of the Forest*, a complementary charter to the *Magna Carta* first issued in 1271, which warranted rights of access to the royal forest, some of its provisions remaining in force for centuries (Linebaugh 2008).

The 'Romanist' outlook criticizes what its adherents consider a mythicization of communal life in premodern societies; a romantic view that forgets the extent to which such societies were characterized by extreme poverty and dramatic inequalities, how the commons were instrumental to reproducing existing relations of property, and how they were open only to some villagers (see De Moor et al. 2002). Furthermore, it is stressed, the Roman tradition conceives of private property not as premised but as subordinated to common property, and offers important conceptual distinctions for a legal treatment of the commons: first, between things that can be bought and sold and things that cannot, being earmarked to a public use (*res in commercio* vs. *res extra commercio*); second, between *res publicae* (things belonging to the citizens) and *res communes omnium* (things such as air, water, the sea, or fish, belonging to all humans). Additionally, it is claimed, the notion of *res nullius* (literally, 'no one's things'), does not mean, as usually understood, open access or derelict resources which can be freely appropriated, but things that, being not owned by anyone in particular, belong to each and every member of the community (Thomas 2002; Spanò 2014).

These are more than academic disputes. Roman and medieval institutions play here the role of 'invented traditions', in Eric Hobsbawn's (1992) sense. The past is not considered for its own sake, but also as a

means for addressing current issues—how to devise a 'right to the commons' in reply to plunder, exploitation, damage and exhaustion.

The route can be constitutional, as Ecuador and Bolivia have followed in 2008. The Quechua notion of *sumak kawsay* or the Aymara one of *suma gamaña* (rendered in Spanish as *buen vivir*, that is, 'living well') express the idea of a fullness of life achieved in the gathering together of the human and the nonhuman, the material and the spiritual. This entails recognizing rights—of respect, maintenance and regeneration of vital cycles, functions and evolutionary processes—to the *Pachamama*, the Mother Earth, as composed of elements (animals, plants, ecosystems, spirits) provided with will and sensations of their own. In this framework, very distant from western naturalism and its view of nature as a passive object of manipulation, the commons mainly coincide with indigenous knowledge and ownership of land.

This approach raises various questions. One is that, as a recent, indeed ongoing, elaboration of indigenous cultures (Gudynas 2011), *buen vivir* is no less invented a tradition than European ancient or middle age institutions for the commons. Moreover, if nature is a moral subject, who is entitled to talk in its name remains unclear. And one should distinguish between solemn declarations and actual regulations and practices. For example, in the Ecuadorian constitution the state retains administrative and decisional control over biodiversity and natural resources, while the President can impose a national development plan (in case of opposition the national assembly can be dissolved). And observers have noted how, notwithstanding indigenous and local autonomies, extractivist and productivist policies proceed largely undisturbed (Gudynas 2010).

The constitutionalization of the commons, however, exceeds the confines of Latin America. In Europe, Slovakia and, recently, Slovenia have included in their constitutions, respectively, water as public property and the right to potable water. About water, worthy of note is the United Nations' Resolution 64/292 of 2010 (*Human Right to Water and Sanitation*), which declares the access to safe and clean water a fundamental and universal right. On a similar line the European Union's Framework Directive on water policy (2000/60/CE) says that water is not a commercial product like any other but a heritage that must be protected, defended and treated as such.

These examples show that the right *to* the commons is not necessarily linked to a right *of* the commons. It can just be considered a social right. The constitutional route is not indispensable, moreover. For example, in 2010 a bill was filed at the Italian Senate to amend the civil code, adding the commons as a third type of goods beside private and public ones. Commons are defined as 'those things which express utilities functional to the exercise of fundamental rights and the unconstrained development of the person'.[11] In this perspective, of course, what is at stake is not property but access.

Though innovative, this proposal raises some questions. First, by referring to fundamental rights, the commons become 'merit goods', that is, goods that any individual should have on the basis of some concept of need, in its turn based on an account of the common good and social justice. This exposes their acknowledgment and protection to the vagaries of the political conflict. For example, is health a commons in the sense of a merit good, and how is such an account to be implemented? Replies vary according to the political culture and welfare arrangements of the countries, and the political ideology of the governments. Moreover, the almost unlimited variety of potential commons—from education services to urban spaces, from work to information, ideas and whatever (material or immaterial) is considered as cultural heritage—is hardly amenable to a consistent legal framework. Yet, the main problem with framing the issue of the commons in terms of fundamental rights, is possibly another. By understanding the commons as rights of access the debate seems to come full circle, returning to the original focus on management. Access entails availability; availability entails maintenance. The central figure becomes the administrator, who takes care without owning (Napoli 2014). However, key to Ostrom's outlook was also the issue of self-government—users' own regulation of a resource—which a rights-based approach makes optional, and the ensuing duties and reciprocal obligations, which a rights-based approach may obscure. Access and self-government are two different situations, even though, once regulated by some external authority, access can be self-managed. The communal tie builds not only on rights but also on duties. What people share is also, and perhaps first of all (Esposito 2009), a debt towards the collective. Focusing on rights may lead to

neglecting duties, especially if the former are understood as individual rights, since in this case the obligated counterpart is ultimately the state, rather than each and every participant in a commons. And one should possibly recall how neoliberal governance thrives on managerialism, as allegedly suited to overcoming ideological conflicts by means of technically efficient and value-neutral handling of 'problems'.

Conclusion

To sum up, the commons are a theoretically unsettled notion, which deserves greater attention in the environmental social sciences. According to the philosopher Massimo De Angelis, 'the commons and their elements (communities and pooled resources) occur both at the beginning and at the end of a social process of commoning, of social cooperation among commoners' (2013: 608). This account is elegant yet leaves unaddressed how the relationship between humans and the nonhuman world is to be conceived. This is a relevant point for—and beyond—environmental sociology. As the previous discussion suggests, there are costs in stretching too much the notion in the direction of citizenship or human rights, or equating material and knowledge commons without considering differences and interconnections. The concept of the commons calls into question the distinction between nature and culture, subject and object, public and private, real and virtual, putting things and people in a reciprocally constitutive relationship. Yet, the balance between thingness and human agency is precarious, always at risk of tilting towards the one or the other polarity, according to topics or theoretical frameworks.

The human-nonhuman connection, however, is crucial. Commons, I submit, are socio-material assemblages also when the cognitive element takes centre stage. On the other hand, dual ontologies are increasingly becoming the bread and butter of plunder and value extraction. This represents a major challenge for the case for the commons, and the reason why further elaboration of the notion is needed.

We have seen that three forms of social relation are at stake with the commons: access, management, property. And we have seen that neither is without problems. Access tends to focus too much on rights and too

little on duties; management to obscure basic divergences about meanings and goals; property to exclude and hierarchize. The shared thread of these notions, however, is the idea of earmarking things to a certain use in common. But which use? Whatever humans decide? Or in accordance with what is (acknowledged to be) in the 'nature' of things?

This is an open question—a fundamental one, I would say—which environmental sociologists, as increasingly concerned with practices in their intertwining of the social and the material, are well-suited to address. Practices (see Huddart-Kennedy and Hauslik, this book) offer an entry point into the question of use, which we have seen bears major relevance to the issue of the commons. The philosopher Giorgio Agamben (2013) has recently reflected on Franciscans' attempt to work out a way of living based on a non-proprietary attitude towards things. Franciscans talked of factual use (*usus facti*); thus, not a use *right* but use *as such* (a practice, we could say), as animals use what nature offers them according to their needs. To make their case, however, they chose to enter legal disputes, rather than rejecting the logic of rights as a whole. For Agamben, this is a crucial reason for the historical failure of Franciscanism in its battle for a pauperist Church. Yet, whatever its pitfalls, giving up—or just weakening—the shelter of law in favour of the immediacy of practices seems a risky route, especially considering how technology continuously expands the scope for appropriation and how, as noted, dominant cultural models may be unwittingly reproduced while working out 'alternatives'. And one should reflect that the Franciscan elaboration is also at the origin of the modern account of property, as based on human will over, rather than relation with, things (Grossi 1972).

So, nothing is simple. Franciscan use, in this context, is another 'invented tradition': not only a matter of historical truth, but of present questions. What many surviving and emergent commons show, in fact, is a deactivation of the received wisdom about humans and things—the former's sovereignty over the latter in the pursuit of a relentless 'valorization', the increase in their capacity to fulfil ever-expanding desires and expectations—as disclosing a possible reconciliation with the world. More than the past, the commons represent and prefigure a future: the only likely alternative to runaway techno-capitalist fantasies of doing without nature.[12]

Notes

1. The commons, on the other hand, have never taken real momentum in environmental sociology, as testified by their usual scant treatment in handbooks and textbooks. Why? Elsewhere (Pellizzoni 2016) I have argued that, even if environmental sociology was born to remedy the disregard of mainstream sociological thinking for the interaction of human societies with the material world, the discipline has for long been embroiled with the realism/constructionism diatribe, either relying too uncritically on scientific objectivism, or focusing too much on environmental discourses and claims. As a result, the constitutive nexus between human communities and biophysical materiality has been neglected.
2. The expression 'comedy of the commons' has possibly been first used by Carol Rose (1986), with reference to situations in which the usefulness of a resource increases with the increase in the number of its users. Typical examples are roads and waterways. Another classic example is information (see below).
3. In the literature, situations in which common and private rights interact are called 'semicommons'. For example, in the medieval open-field system typical of north-western Europe, land, divided in scattered portions, was privately owned and cultivated, while used collectively for grazing (Smith 2000).
4. For Ostrom this is a viable solution for global commons such as the oceans, the atmosphere or biodiversity (Dietz et al. 2003).
5. 'Secundum ius naturale omnia sunt communia' (*Summa Theologiae*, II-II. 66, 2).
6. Land grab has intensified after the food prices crisis of 2007–2008, that gave salience to the question of food security, overlapping with issues of energy supply and financial instability (Borras et al. 2011).
7. These include provisioning (e.g. food, water, energy, genetic and medicinal resources); regulating (e.g. carbon sequestration and climate regulation, waste decomposition, pest and disease control); supporting (e.g. nutrient cycles, soil formation, crop pollination); and cultural services (e.g. spiritual and recreational benefits). See Millennium Ecosystem Assessment (2005). On ecosystem services see also Van Koppen and Bush, this book.
8. Examples range from the FlavrSavr tomato (the first commercialized transgenic plant, in 1994), modified in order to make it more resistant to rotting, to the AquAdvantage salmon, genetically modified to grow quicker.

9. The blurring of the social and the natural is implied also in the burgeoning notion of Anthropocene. See Lidskog and Waterton, this book.
10. According to Marx, capitalism uses money not as an intermediary to the circulation of commodities (C-M-C), but the other way round: commodities circulate to enable the increase in the amount of money (M-C-M'). The goal is not the enjoyment of goods but the expansion of profit. This, however, shows that capital cannot expand itself directly (M-M'). The explosion of speculative 'bubbles' indicates the fictitiousness of any such expansion. Yet, if materiality is the source of wealth, the assumption that value production is kick-started by the 'gratuitousness' of nature's goods – an assumption shared by liberal and Marxist economics and reproduced in the idea of ecosystem services – is brought into question by resource depletion and environmental threats.
11. The bill can be found at: https://www.senato.it/service/PDF/PDFServer/DF/217244.pdf [accessed 19 January 2017].
12. An example of such fantasies is the *Ecomodernist Manifesto* published by a neoliberal think tank, the Breakthrough Institute. See http://www.ecomodernism.org/manifesto [accessed 30 March 2016].

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14

Spatial Frames and the Quest for Institutional Fit

C. S. A. (Kris) van Koppen and Simon R. Bush

Introduction: An Environmental Sociology Reading of Space

Space is a fundamental category in understanding our biophysical environment and in ordering our socio-political relationships. Spatial frames, we argue, are ways of seeing and categorizing life world phenomena with the help of, and molded on notions of space. Spatial frames are important in that they shape how environmental problems are understood as well as how action on these problems is taken. In environmental policy and planning spatial frames have taken a prominent role, as evidenced by concepts such as spatial policy, urban sprawl, land use planning, designation and zoning of protected areas, siting of industrial activities, dispersion and containment of pollution, and many others.

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A key feature of space, contributing to the strong appeal of spatial framing, is its seemingly exact and objective character. In its classical, Cartesian interpretation, space can be measured in three dimensions of linear distance, separated with clear boundaries, and nested according to well-defined levels of scale. The territorial space of nation-states, subdivided in provinces and municipalities, is the typical example of such a seemingly seamless spatial lay-out.

In applying spatial frames to environmental issues, however, space emerges as a much more complex category. Rather than one universal and objective space, there are different spaces, each of them vested with different social powers and riddled with blurred boundaries and cross-scale processes. Technological innovations and processes of globalization have reconfigured social space by 'stretching' the ranges and modes of social relationships in such ways that they 'become networked across the earth's surface as a whole' (Giddens 1990, p. 64). Environmental sociology—together with affiliated fields such as human geography and political ecology—seeks to clarify the societal dimensions of space and find out how specific spatial framings can obstruct or contribute to environmental justice and reform.

Building on a social scientific understanding of space, this chapter aims to characterize some of the major spatial frames that are involved in environmental policy and action. In doing so we point out some ways that spatial frames can be used to tackle the environmental challenges of our time, in particular those related to ecosystem and biodiversity management.

The key question we address is: what are the meanings and roles of spatial frames in mediating between socio-political processes and ecosystem management? A key concept in answering this question is institutional fit. According to Young (2002, 2008), institutional fit refers to the match between institutional arrangements and the defining features of the problems they address. The paradigmatic example of failing institutional fit is nation-states trying to tackle problems with biophysical features that play out on a global scale. In response, a better fit is often sought in moving up to supra-national institutions. In ecosystem management, however, institutional fit is also sought by shifting to lower scale levels than the state. In both cases, institutional fit is often interpreted as

a spatial match or 'concordance' between ecological systems and governing institutions (also see Cash et al. 2006). As we will show, many authors including Young himself have argued that this is a far too simple approach. Institutional fit, like space, is a complex and multidimensional concept. Interpreted in such a broad sense, the concept of institutional fit will serve as a red line throughout the chapter.

First, we explore territorial space, in particular the nested hierarchy of scale attributed to nation-states, and investigate the roles of power and justice in territorial framing and problems of matching territorial and ecological space. We give special attention to the debate on social-ecological systems as a key spatial frame put forward in natural resource management. Then we discuss flows and networks as spatial frames that emerge as alternatives to territorial hierarchies. Lastly, we discuss a somewhat different, but equally crucial way of framing space, centering on place and meaning. We end with conclusions and an outlook.

Territorial Space and Power

The Territorial Power of the Nation-State

The most prominent and well-known social framing of space is territory. Territory is usually defined as an area of land under the jurisdiction of a ruler or state (Oxford Dictionary). Over the last few centuries, nation-states have developed into the sovereign powers that rule most of the world's terrestrial land. In the late twentieth century sovereign control was also extended offshore to 200 nautical miles from a nation's coastline.

The concentration of territorial power with the rise of the modern nation-state is aptly characterized by Saskia Sassen (2006, p. 6): "Where in the past most territories were subject to multiple systems of rule, the national sovereign gains exclusive authority over a given territory and at the same time this territory is constructed as coterminous with that authority, in principle ensuring a similar dynamic in other nation-states. This in turn gives the sovereign the possibility of functioning as the exclusive grantor of rights."

As Sassen and many other scholars have shown, processes of privatization and globalization are challenging this position of the state in terms of territory, authority and rights (for an elaboration see Mol, this volume). We will further explore these processes in the next section. With regard to spatial framing, nonetheless, the territorial power of nation-states has a substantial and often decisive impact on space-related environmental activities. Many multilateral environmental agreements explicitly confirm the authority of the sovereign state over its territory. The Convention on Biological Diversity, for example, affirms in its preamble "that States have sovereign rights over their own biological resources" (Secretariat of the Convention on Biological Diversity 2005, p. 3).

As illustrated by the strong wording in the CBD, the territorial power of states is emphasized with particular strength in the management of biological resources. In present legal systems, it is common to consider natural resources within a nation's territory, like minerals, oil or gas, but also wildlife and nature reserves as property of the sovereign state. State sovereignty implies that the state has the right to control, extract, and tax resources within its territory (Moore 2012; Simmons 2001). Returning to Sassen (2006), the distribution of rights and revenues of resource exploitation between the state administration and other actors, such as local level administrations, indigenous people, or private companies, is then a strong indicator of a state's territorial power relative to other assemblages of territory, authority, and rights.

Land Use Planning and Designation of Nature Reserves

Authorities designating specific forms of use to specific areas have been around for many centuries, but systematic spatial planning under the responsibility of specialized state agencies has only emerged since WWII. In systematic forms of spatial planning, virtually all state territorial space is designated to specific land use functions, while zoning is applied to reduce conflicts between different functions. In many Western countries, such as the United States, Canada and the Netherlands, spatial planning has become a key governmental policy instrument for regulating interests and functions related to land use (Cullingworth 2002; Hajer and Zonneveld 2000).

Nature conservation is a case in point. Designating areas with varying degrees of 'natural value' is a commonly used policy instrument, with consequences for the way these areas are seen and dealt with. Defining rural areas as nature—rather than agricultural, industrial or residential land—highlights their status as a commonly held natural heritage, and usually downplays the role of humans in shaping and using the land. What such designation also does is bring them more closely under state territorial control.

Under conventional modes of nature reserve designation, the state hierarchy is commonly not disputed (Van Koppen 2006). Instead debate tends to focus on defining the most appropriate level of governmental control, e.g. federal, state, or provincial level. In many countries, there is a tendency towards the decentralization of control to local levels of government. But in the European Union, we also see the upscaling of nature policy through, for example, the Bird and Habitat Directives, resulting in the designation of Natura 2000 sites in all member states. Whilst decentralization and centralization change how state control is enacted, it does not mean a decline in state power, since authority for nature protection still comes from the authoritative power of the state via mandate or agreement.

Critique of State Territorial Power

There are two main strands of criticism on this conventional configuration of state-regulated natural resource management, which target different aspects of institutional fit.

The first strand has a rather functional focus and stresses the incapacities of the state to effectively regulate, implement, and monitor nature conservation, because of misfits in scale and failures to adequately include non-state actors. As argued by Hooghe and Marks (2003), for instance, arrangements based on function-specific networks crossing the jurisdictions of the spatial hierarchy of the state can be better suited to overcome transboundary environmental problems.

A second, more fundamental strand of critique focuses on the repressive character of state control. Brockington (2004), for example, demonstrates that while states can effectively control nature protection, it can lead to the marginalization of local inhabitants. Many studies on nature parks and

reserves in Africa and Southeast Asia have shown that these spatial policies exert power over rural areas and cut off communities from access to natural resources (e.g. Dupuis and Vandergeest 1996; Neumann 1998). Authors in this strand of critique contend that spatial planning, far from being a functional tool, also co-defines power relations in land use. But while critical, such evidence does not amount to an unequivocal rejection of state power. While state power can be repressive, lack of state control can lead to power abuse by other actors. Buscher and Dressler (2007), for example, show for South Africa how a lack of adequate government planning leads to a promulgation of private game reserves and exclusion of local communities (see also Pellizzoni, this volume, on 'enclosures').

In response to the functionalist critiques on the state, and to some extent in critique of unjustified state power, the last two decades have seen a shift in spatial planning thinking. Doubts and criticism about the role of the government as top-down planner are on the rise, and there is more attention to spatial planning as an instrument to coordinate area-related policy agendas, facilitate negotiation between stakeholders, and realize practical win-win solutions rather than improved regulation (Allmendinger and Haughton 2010; Hajer and Zonneveld 2000). Such thinking about spatial planning, which stresses local participation and inclusion of different stakeholders, is also manifest in professional and academic literature on nature parks (e.g. Pimbert and Pretty 1995; Wilshusen et al. 2002). Relatedly, there is a rising stream of studies applying similar approaches to territory in maritime planning (Kidd and Shaw 2013).

Social-Ecological Systems and Ecosystem Management

Coupling Ecological and Social Systems

Critiques on state-level spatial planning and emphasis on stakeholder negotiation resonate within the concept of social-ecological systems (SESs), which has become an influential spatial frame for ecosystem management (Holling and Gunderson 2002). Several streams of thinking have contributed to the development of this concept. These include

adaptive co-management as a management approach based on self-organized learning processes (Berkes and Folke 1998; Folke et al. 2005); the ecosystem approach, which was developed within the framework of CBD COP meetings, and formalized into 12 principles in 2000 (Hartje et al. 2003; U.N.E.P. 2000); and the work of Elinor Ostrom and co-researchers, who took up SESs as a flexible and inclusive framework for the design of natural resource management institutions (Ostrom 2009).

The systems thinking that underpins SES is outlined eloquently by Elinor Ostrom. She describes SESs as follows: "SESs are composed of multiple subsystems and internal variables within these subsystems at multiple levels analogous to organisms composed of organs, organs of tissues, tissues of cells, cells of proteins, etc. In a complex SES, subsystems such as a resource system (e.g., a coastal fishery), resource units (lobsters), users (fishers), and governance systems (organizations and rules that govern fishing on that coast) … interact to produce outcomes at the SES level" (Ostrom 2009, p. 419).

As is apparent from Ostrom's description, SESs form a powerful spatial frame of coupled human and natural systems, structured in a hierarchy of interacting levels of scale. Key concepts for analyzing the dynamics of these coupled systems are ecosystem processes, resilience, complex systems and tipping points, adaptive cycles, and ecosystem services. With the help of these concepts, advocates of SES aim at providing a new, integrative, dynamic, and multi-level spatial framing of resource management problems, one that advocates argue provides a better starting point for designing institutions than the nested hierarchy of state regulation.

SESs and Institutional Fit

Institutional fit, as it is conceptualized within the SES approach, can be summarized in three interrelated characteristics.

The first characteristic is the central importance of ecosystem dynamics in determining the optimal institutional scale. The institutional design should match with the biophysical scale of vital biophysical processes. Similar to the conceptualization of territorial space, nested hierarchies of scale are central, but it is not the structures of state authority, but the ecosystem processes that receive primary attention.

A second characteristic is a preference to address problems, as far as the ecosystem dynamics allow, at local levels of scale. This is epitomized in principle 2 of the Ecosystem approach, which states that "management should be decentralized to the lowest appropriate level". The rationale for this principle is that at this lowest level, stakeholder responsibility and participation are higher, and greater effectiveness and equity can be achieved (U.N.E.P. 2000). The principle resembles that of subsidiarity in policy making.

The third characteristic is a preference for local self-governance. This idea is, for example, apparent in Ostrom's design principles for governing common pool resources. Principle 1 states that the boundaries of the resource and its legitimate users should be clearly defined, and principle 7 advocates the rights of local stakeholders to devise their own institutions, "not challenged by external governmental authorities" (Ostrom 1990, p. 90).

Taking these characteristics together, institutional fit in its simplest form implies two things. First, the proper biophysical scale of the environmental problem is identified and its boundaries defined, and second, within these boundaries, institutions for natural resources management are designed to match the natural resource management required.

It is obvious that actual situations of natural resource management are much more complex than such a simple fit between ecological and social systems—a point continuously stressed by all major authors of the SES approach. Yet, this ecology-inspired, straightforward approach to spatially framing environmental management has had a wide appeal to scientists and policy makers. In many initiatives for new forms of environmental governance we can explicitly or implicitly find elements of SES thinking. For example, in community-based, collaborative arrangements for managing nature parks, forests, and coastal environments. But perhaps the most salient example of SES thinking is river basins. As seen in many countries around the world, efforts to reorganize water management have institutionalized in new and integrated types of river basin authorities (committees, platforms, agencies, boards) designated to the management of multiple water users in (sub)catchment areas.

Critique of the SES Approach

By moving away from the kinds of rigid designation of land use functions and zones promoted by state-led spatial planning, SES thinking has opened up innovative solutions for more functional, integrative and locally-adapted management institutions (Cox et al. 2010). Nonetheless, there is grounded criticism on the applicability of SESs as a generic approach.

In managing ecological problems it turns out to be difficult to realize the aim of 'local control over local issues' (Batterbury and Fernando 2006; Young 2002). The benefits provided by an ecosystem in a specific area, and the interests of stakeholders involved, can vary from local scales (e.g. revenues from harvesting) to global scales (e.g. conservation of endemic biodiversity) (Hein et al. 2006). Moreover, the dynamics of the socio-economic and biophysical drivers of ecosystem changes and of the institutions needed to cope with them, are most often characterized by multi- and cross-scale interactions.

An interesting example is provided by Warner et al. (2014) who observe that integrated water resource management through stakeholder participation at the river basin scale has become a dominant framing in water management and planning. Arguing against this trend of seeing the river basin as a 'natural' scale of water governance, they present cases in Ecuador and Turkey to show that key negotiations and power struggles are not located at the river basin scale, but instead across "different arenas at different scales" (Warner et al. 2014, p. 478). Proponents of the basin level as the 'right' scale ignore that this framing implies particular political choices and power relationships. "Rather than politics being incidental to scale," they conclude, "scale may well be incidental to politics" (Warner et al. 2014, p. 478).

To be fair, many such critical observations can be found in the works of prominent advocates of SESs themselves, though often without drawing the full consequences for the application of the SES approach. A more consequential critique on mainstream applications of SESs is formulated by Eduardo Brondizio et al. (2009). Starting from an analysis of the Xingu Indigenous Park in the Amazon region, they discuss the connectivity of SESs and the roles of social capital. The central message of

their study is that "no fixed spatial or temporal level is appropriate for governing ecosystems and their services effectively, efficiently, and equitably on a sustainable basis" (Brondizio et al. 2009, p. 259). Based on their analysis, they argue for "a different style of scholarship from the dominant orientation of many social and physical scientists who study social-ecological systems" (Brondizio et al. 2009, p. 259). A promising idea for new scholarship, according to the authors, is that of place-based management. We will revisit this concept in our discussion of the space of flows.

Territories, SESs, and Institutional Fit

In sum, scholars have proposed SESs as a spatial framing that responds to functionalist critiques of the state and avoids mismatches in scale. The SES approach aims at achieving institutional fit by building new, self-organizing institutions of territorial management that match the biophysical scale of environmental problems. However, many current studies—including research of SES scholars themselves—show that in this simple form the SES approach often fails to meet its claims of effective and equitable management of resources.

Clearly, all this does not diminish the need of developing better fitting institutions for environmental reform. Based on the argument so far, there are at least two—interrelated—ways of moving further.

On one hand, particularly in cases where the state remains paramount to ecosystem management, it might be more useful to focus attention on improving the fit of existing institutional arrangements in providing equitable and effective natural resource management solutions, rather than matching institutions with ecological scale alone. It is, after all, the capacity, the legitimacy, and not least, the decency of the state administration which often determine the outcome of management processes. In this perspective, it is not the fit of spatial framing with ecology that matters most, but the way spatial framing is used to promote or counteract specific interests (cf. Brown and Purcell 2005). Research and practice could focus on improving the state's role in accommodating state-related assemblages of territory, authority and rights with other actors and interests, for the benefit of ecosystem health and human well-being.

On the other hand, particularly where non-state actors are crucial and cross-scale connectivity grows far beyond the reach of a single state (or where states are incapable of or obstructing environmental reform), spatial frames beyond the territorial power of states may offer new possibilities of tackling environmental problems. This is what we turn to now.

Globalization and the Space of Flows

Networks and Flows

Much of the current environmental sociology literature revolves around globalization, with its component processes of globalizing flows of capital, information, goods and persons, as well as pollutants and invasive species (see also the chapter by Oosterveer in this volume). All these processes have deep impact on spatial framing.

In contrast to the scalar spatial frames of state territory and SESs and their nested geographical hierarchies, the spatial frames discussed in this section take a different starting point. Spatial structures are not conceptualized as areas with boundaries, but in terms of 'scapes', which consist of networks and flows as much as areas, and of social relationships as much as geographical scale.

Several authors have suggested concepts for doing so. John Urry has proposed the concepts of *regions, networks and fluids* to theorize the mobilities that characterize our globalizing world (Urry 2000). Bulkeley discussed *networks of spatial connectivity* to highlight the role of non-scalar geographies of space (Bulkeley 2005). Mol and Spaargaren (2006) put forward *governance of flows* as a promising way to understand environmental change. But central to many of these concepts of flows and networks is the work of Castells (2000), who analyzes the globalizing world with the concepts of *network society*, *space of places* and *space of flows*. We will take Castells' concepts as starting point.

Castells defines the space of flows as "the material organization of time-sharing social practices that work through flows" (Castells 2000, p. 442). More concretely, he describes the space of flows as a combination

of three layers: (1) networks of electronic exchanges; (2) nodes and hubs that these electronic networks connect with and that coordinate and switch the functions of the networks, including the global financial system; and (3) the spatial organization of dominant managerial elites.

This space of flows, however, does not permeate to the whole realm of human experience. A majority of people, Castells also argues, perceive their space as place-based—with place understood as "a locale whose form, function, and meaning are self-contained within the boundaries of physical contiguity." (Castells 2000, p. 453). A town, a city, or a quarter in a city, which is recognized by its residents as their common daily living environment, can be a place in this sense. Just as a city park, like New York's Central Park, can be a place, or rural areas, nature parks, and other kinds of landscapes.

Networks, Flows and Ecosystem Management

While biophysical flows exist and play important roles in ecosystem functioning, ecosystem management or natural resource management almost always involve the management of places. Ecosystem management in a network society therefore, is strongly affected by the interaction of specific flows and specific places, and environmental governance is crucially concerned with these interactions. There are innumerable examples of these processes, but we will focus mainly on two: networked views on nature areas, and 'territorialization', as the interaction between territorial processes and socio-economic flows.

Nature Networks and Global Hotspots

Over the last 25 years, networked views on nature have gained popularity. Some of the nature networks, like the National Ecological Network in the Netherlands, have actual biophysical connections, in the form of green corridors. In many other cases, such as the Natura 2000 network in the EU, or the UNESCO World Network of Biosphere Reserves, the network links are socio-political. The areas that are part of the network are connected through a socio-political logic in which they are enrolled.

Perhaps the most global and influential case of such a networked view on nature is that of the *biodiversity hotspots*, promoted by Conservation International, and introduced in an influential article in Nature by Myers et al. (2000). The 25 hotspots identified by these authors are defined as "areas featuring exceptional concentrations of endemic species and experiencing exceptional loss of habitat." Endemic species are central, because they are considered "as the most prominent and readily recognizable form of biodiversity" (Myers et al. 2000, p. 853). Hotspot boundaries are determined on the base of 'biological commonalities'.

In terms of Castells, the space of flows in this case is a global network of conservation biology, NGOs, funding agencies, and sponsors. The places are the designated hotspots, concrete geographical areas with local communities and institutions, but (re)defined from a specific global conservation logic, based on the 'calculus of biodiversity' (Vane-Wright 1996). As outlined by Van Koppen (2006), this logic has strong impacts on the places it touches. Being 'hot' changes the ways a place is inserted into global flows of money, science, and governance. The hotspot approach resembles the SES approach in putting conservation values and bio-physical argumentations first, and can be criticized for similar reasons. While the arguments for preserving hotspots can be plausible and legitimate, they need to be weighed against place-based values and institutional arguments to result in effective and fair ways of ecosystem management.

Linking Value Chains and Territories

While hotspots represent an encounter between the global flows of conservation NGOs and places, there is also, and perhaps even more importantly, the encounter between production and consumption chains and places. Conventionally, value chains are thought of as connecting economic actors: consumers, firms, producers. This picture, however, is currently shifting.

Research on certification, risk management, supplier upgrading, and conservation in value chains has emphasised the role of collaboration between producers in specific areas and global buyers in optimally managing

the area's natural resources. This newly emerging approach, promoted by both multinationals and NGOs, is labeled by some as the 'landscape approach' to sustainable sourcing (Kissinger et al. 2013; Ros-Tonen et al. 2015). Its aim is to "provide a framework to deliberately work beyond the farm scale to support food production, ecosystem conservation, and rural livelihoods across entire landscapes in an integrated manner" (Kissinger et al. 2013, p. 1).

Similar approaches are emerging under the labels of area-based, or place-based. Acknowledging the connectivity and multilevel character of resource management, they aim to find feasible responses to fragmentation of authority and spatial and temporal mismatches in the management of terrestrial and marine resources (on conflicting temporalities, see Locke and Wong, this volume). Returning to Brondizio et al., such a place-based approach is distinct from prevailing SES approaches, because it views "places as complex and dynamic systems that are open rather than closed in character" and because it features participation of government at different levels as well as other stakeholders (Brondizio et al. 2009, p. 271).

By opening up to flows and networks, landscape or place-based approaches create theoretical and practical options for value chains to intersect and assert influence. In this vein, Vandergeest et al. (2015) analyze the relationship between value chains and territories in the case of seafood certification. They show how certification in value chains can lead to the articulation of 'sustainable territories', such as communities of shrimp farms in their coastal environment, or demarcated fishing grounds. The process in which such territories are assembled—involving governmental bodies, value chain actors and other non-state actors—they label 'territorialization'. As they demonstrate, this process can have different faces. In some cases, it can be a kind of 'green grabbing' akin to the notorious practices of land grabbing. In other cases, it may offer prospects for a more sustainable configuration of value chains sourcing natural resources, akin to the place-based approach advocated by Brondizio et al. (2009).

As these examples show, landscape-based approaches are ambivalent in their outcomes, which may range from land-grabbing to sustainable and fair management of local resources. Given the emergence of a global network society, however, they appear to be a highly relevant and interesting spatial framing of ecosystem management.

Non-scalar Perspectives and Institutional Fit

So how to understand institutional fit in a perspective of flows and networks?

What this perspective points to is the problematic nature of nested hierarchies of geographical scale when faced with the networked character of social relations. As we argued in the introduction of this chapter, nation-states trying to tackle problems with socio-economic and biophysical features that play out on a global scale are unlikely to be successful if value chains, networks and flows are not considered. However, we also concur with Bulkeley (2005) in arguing that a polarization of the debate into 'scalar' and 'networked' perspectives should be avoided. With her, we argue that hierarchies of geographical scale and networks of spatial connectivity can be better seen as mutually constitutive aspects of spatial framing.

Castells' formulation of the space of place and the space of flows is again highly instructive to explain this mutually constitutive framing. He observes that the relationship between the two spaces is simultaneously one of globalization and localization, and the outcome of this relationship is not predetermined (Castells 2000, p. 458). He also points out that there is a tension between the two spaces. The structural domination of networks and flows alters the meaning and dynamic of places, and there is a threat that the logic of power becomes abstracted from experience of places. Castells therefore pleads for building cultural, political and physical bridges between these two forms of space.

Following this line of thinking we suggest that, in the context of global flows and networks, institutional fit is determined by what kinds of institutions offer the most socially and environmentally sustainable match between a specific place and the global flows and networks it is embedded in. Much more should be said about this, but in the limited scope of this chapter we suffice with saying that the landscape approach and kindred initiatives offer ambivalent but interesting perspectives for understanding and developing such matches. One example of an initiative in this direction is the sustainable cocoa partnership project in the Bia/Juabeso region of Ghana. In this project a global food chain company (Olam), a certifying NGO (Rainforest Alliance) and local farmers cooperate in building cocoa production areas mixed with forest lands, to break with deforestation, become more resilient to climate change, and increase income for farmers (Brasser 2013).

The Meaning of Place

We cannot conclude this chapter, without pointing at another crucial framing of space: space as place. We have touched on this framing in the previous section, but without due elaboration. In this section, we will make up for this omission, even when we can only provide a very condensed account.

Many authors discussing ecosystem management have pointed at the vital importance of emotional attachment and socio-cultural meanings in motivating people to participate in conservation and sustainable use, and the role that sense of place can play in this respect (e.g Masterson et al. 2017; Williams and Stewart 1998). Place, therefore, is another crucial dimension of institutional fit. In this dimension, institutional fit means that there is a socio-cultural fit, which makes institutions match with common emotional, aesthetic, historical, and moral attachments to a place. These attachments build on symbolic and sensual experiences of enjoyment, pride, heritage, belonging, security, and identity that develop over time in relationship with a specific spatial setting (Tuan 1974). Whether such attachments develop—or rather negative meanings such as isolation, deprivation, or fear—depends on the social and political processes that put their stamp on a place (Harvey 1996).

So how is the meaning of place reflected in the three spatial frames outlined above, and how does it affect the ways these framings understand and deal with institutional fit?

State territorial spatial frames have dealt with spaces of place and meaning in different ways, but aesthetic and other cultural connotations of place have played and still play an influential role. This is, for instance, manifest in terms like national parks, cultural heritage, or nature monuments in reference to protected nature areas and landscapes. Notions of parks and landscape not only define boundaries based on biophysical conditions but also have cultural connotations. The use of 'landscape' in nature protection is telling in this respect, as it is derived from a specific genre in the art of painting to represent broad notions of nature (Schama 1995). Landscapes—in the sense intended here—can represent wilderness, but also agricultural land, coastal and sea areas ('sea scapes'), and buildings or even urban scenery, as long as there are animals and plants and some degree of natural dynamics.

Many social-ecological system studies, in spite of their idiom of systems, resources, feedback, resilience, biodiversity, and ecosystem services, are deeply indebted to the cultural and emotional meanings of place that underlie nature conservation efforts. The ecosystems they aim to manage and preserve are not just convenient units of scale, and they are not only protected for their contribution to higher yields or for their carbon-storing capacity. To many advocates of SESs they represent green places that carry strong emotional attachments, rooted in the cultural motives that have historically driven nature conservation efforts (Takacs 1996; Van Koppen 2002).

The spatial frame of networks and flows, and institutional fit within this spatial frame, is also shaped by meanings of place. Building again on Castells, it is clear that places can no longer be framed in terms of isolated local communities. Now more than ever, places are connected by networks and flows, and place attachment can extend in space to other landscapes than the ones that we dwelled in before. It is clear that extension of cosmopolitan and often vicarious assignations of nature are captured and used in the design of networked institutions. For instance, the market prescriptions of sustainable landscapes through eco-certifications like the Rainforest Alliance, or the meaning ascribed to the WWF's Panda giving that organisation a central role in advocating for the creation of nature parks.

In all three cases of spatial frames, it therefore appears that emotional and cultural attachments to 'green places'—landscapes or elements of landscapes—have a role to play. These attachments are akin to what literature describes as sense of place, and they give meaning to spatial frames in ways that go beyond ecological protection and regulation of resource use. As we have argued, these connotations of place should not be conceived in purely local, place-bound terms; instead, sense of place can be subject to flexible and networked meanings. Nonetheless, there seem to be two binding restrictions to sense of place. One is the existence of a *locus*, in the sense of a specific, concrete and localized setting that carries the attributes of meaningful attachment (as linen and paint carry the meaning of a painted landscape). The other is a certain span of time, which is needed for humans to become rooted in a place and endow it with value (Tuan 1974, 1977). It is not only biotic communities that take time to develop in a place, but also human communities that need time to develop a deep and meaningful attachment to the landscape where they dwell (Van Koppen 2009).

Conclusion

We have presented a social scientific interpretation of space as a set of material dimensions vested with social and institutional meanings. Three particular spatial frames have passed review, characterized by the concepts of territory, social-ecological system, and space of flows and space of places. Cross-cutting these frames, we also argue, is meaning of place. In discussing these frames, we have elaborated an interpretation of institutional fit as a match between the biophysical aspects of ecosystem management in a specific area, the political aspects of territorial control, the socio-economic flows and networks at play, and the socio-cultural meanings of that area as a place.

In pointing at the interactions that span this broad interpretation of institutional fit, we are aware of the complexity we bring to the matter. Taking this complexity into account is needed. But so too are simplifications. It would make no sense—theoretically nor practically—to end his chapter with the conclusion that social reality is more complex than existing spatial frames can capture and the only way forward is further research.

Our conclusion is therefore that none of the spatial frames discussed is obsolete, and each of them can be helpful in theorising social-environmental interaction and in designing practical approaches, depending on the specific situation. What we demonstrate, however, is that they all have strengths and weaknesses that need to be taken into account in determining which spatial frame fits best. For instance, the state has clear limitations in dealing with global environmental flows, but the state remains an indispensable power-container and regulator, which aspires to keep or regain legitimacy through the attribution of territory, authority and rights. Building on this observation, new forms of engagement appear necessary between value chain and landscape-based approaches where ecosystem management and actions of producers and consumers are tied together in global production and consumption chains. In both cases, however, it appears that socio-cultural motivations, reflected in a sense of place, remain underappreciated and not reflected upon in the design of institutional arrangements of any kind. It is clear to us that environmental sociology can make vital contributions to all these fields, and others as well.

Finally, we contend that institutional design needs to start from institutional frames, not ecological ones. This is even the case when a well-functioning ecosystem is a decisive component of success. Hurdles of biophysical fit, such as non-matching ecosystem boundaries, upstream vs. downstream problems, or transboundary pollution, may be hard to overcome. But they are not as difficult as hurdles of socio-political fit, where corruptive state agencies, unequal market powers, local repression, and poverty undermine the potential for environmental sustainability. That is why the latter need our attention first.

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15

Conflicting Temporalities of Social and Environmental Change?

Stewart Lockie and Catherine Mei Ling Wong

Introduction

We are well used to hearing that time is running out to mitigate against catastrophic environmental change. That urgent action is required to reduce greenhouse gas emissions. That the transition to low carbon technologies is inevitable. That social and economic disruption will be minimized if this transition is accelerated. That any kind of economic development needs to be environmentally and socially sustainable. We hear that politicians cannot think beyond the next electoral cycle. Businesses beyond the next profit statement. And increasingly, we hear too that we have entered a new geological era, the Anthropocene, in which human action has come to rival the great forces of nature. The importance of time here could not be more obvious. Notions of change, urgency, transitions, disruption and sustainability would make little sense in the absence of time—even if such a thing were possible.

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At first glance, the meaning of time appears self-evident. Time is uniform and measurable.[1] Time moves in only one direction. Once used, time cannot be used again. Once past, it cannot be revisited. We are surrounded by devices that tell us the time and, increasingly, by devices that monitor how we use time. Where we use time. Our metabolic state—at the time. We wear or carry devices that monitor how much time we spend asleep, sedentary, moving. Devices that monitor how much time we spend at particular locations, velocities, heart rates. Devices that monitor how much time we spend on specific tasks. Devices that coordinate our use of time with others. Our interactions with time have become ever more precise or, to be more exact, our interactions with clock time have become ever more precise.

The ticking of the clock is clearly not the only way in which we interact with time. Moments, events, milestones, seasons, terms, lifecycles, generations and epochs are all bound up in our comprehension and experience of time.

Some of the most enduring debates in social theory have centred on these latter dimensions of time—on the tectonic shifts in economic and political organization, in cultural norms and population movements that signal transformation from one era to another. For classical social theorists including Marx, Durkheim, Sorokin, Mead and Schutz, time had a dual character; first, as an external structure or container in which social action played out; and second, as a kind of collective consciousness that organized and gave meaning to peoples' use and experience of time (Bergman 1992; Castree 2009). Time was both a 'thing out there' and a social fact shaped by class, gender, education, etc. More contemporary theorists exploring similar themes include: Luhmann (1982, 1976), who conceptualizes time as the social interpretation of differences between the past and the future; Zerubavel (1981), who explores the ordering of social life through temporal structures such as schedules, routines and calendars; and May and Thrift (2001), who examine the role of technology in time-space compression (which we will return to), and 'sense of time' as an emergent property of social practices that include, but extend beyond, routines and schedules. Drawing several of these themes together, Rosa (2003) argues that the

acceleration of production, transport, communication, social change and, indeed, the pace of everyday life, ought to be regarded alongside processes of individualization, bureaucratization and industrialization as a defining feature of modernity.

Contemporary social theorists have also begun to explore the importance of biological and other physical processes to the social experience of time. Adam (1998, 1994), for example, examines the imposition of industrial time on the temporal rhythms and fluxes of ecosystems (another theme we return to below). Lefebvre (2004), similarly, focuses attention on the rhythms of the body, the rhythms of molecules, organisms and other elements of nature, and how these come to be synchronized as social 'wholes'. These works represent important steps toward a sociology of time that accounts for the mutually constitutive relationships between social and ecosystem processes. But, as macro-level critiques of modernity, they have comparatively little to say about how we might better apprehend (and indeed reform) the techniques and processes through which such processes are coordinated in time.

By contrast, empirical social sciences have treated time, for the most part, as an un-theorized independent variable—a unit against which to measure change from year-to-year, cohort-to-cohort, and so on (Adam 1998). But the ticking of the clock, and the silent transfer of data between devices that monitor how we use it, highlight additional characteristics of the 'social life' of time of relevance to the social sciences, in general, and the environmental social sciences, in particular. Increasing precision in the measurement of time and space have created new opportunities for surveillance and control. Instruments that measure time are thus instruments of power deployed, not in isolation, but in context of discourses concerning the productive use of time and space, threats to social and environmental security, the responsibilities of citizens to anticipate risks, and so on.[2]

The precision of clock time reflects a particular kind of temporality—that is, a particular way of thinking about time and of regulating the rhythms and tempos with which social and ecological processes unfold (see Lockie 2014). The issue for us here then is not so much the nature of time itself (a question we will leave to physicists and philosophers) but

the possibility of conflict between the temporalities of social and ecological change—between the demands of markets, militaries, politics etc., on the one hand, and the capacity of ecosystem processes to endure, evolve or regenerate, on the other.

In this chapter, we will first explore the concept of temporality in more depth through a review of how time and the relationships between society and environment have been considered in social theory. We will go on to explore some of the conceptual frameworks, technologies and projects through which we seek to influence these processes in the specific context of climate change policy.

Modernity, Measurement and the Abstraction of Time

The identification of trends and patterns is fundamental to social and environmental research. We are interested not simply in how things are but in how they move and change. We are interested in how the trends and patterns we observe at one temporal or spatial scale interact to create new trends and new patterns at other (smaller and larger) scales. Take the inter-related processes of technological innovation and hydrocarbon-fueled economic growth, for example, that climate scientists associate with the genesis of the Anthropocene (see Lidskog and Waterton 2018). Independently of each other, neither the extraction of fossil fuels nor the development of new technologies could have fired the 'great acceleration' of economic activity responsible for anthropogenic climate change (Steffen et al. 2007). Both were required but, even together, fossil fuel extraction and technological development would likely not have led to much in the absence of parallel societal transformations including the bureaucratization of political and economic institutions, the individualization of citizenship rights and responsibilities, the urbanization of populations and the internationalization of trade.

Documenting and explaining inequalities embedded in these transformations is, of course, a dominant theme across the social sciences. The social formations we recognize as capitalist, patriarchal and colonial rest

on contested and uneven but, nonetheless, systemic relations of exploitation. In no small way, the factories, railways and telegraphs of the industrial revolution bent human bodies to the (temporal and spatial) demands of the machine. Foucault (1977), consequently, likens factories to monasteries. Institutions in which time and movement are highly regulated and standardized. Institutions in which timetables and responsibilities are centrally controlled, tasks are performed in very specific ways, and in which no time is left idle.

Anyone with a smartphone in their pocket will have some experience of the manner in which the demands of the machine are shifting. The idea of 'time-space compression' advocated by Harvey (1989) and others makes a good deal of intuitive sense in a world in which the pace of change feels as though it is accelerating and in which the influence of far-flung places on our own lives seems to be growing. A world that feels as if it is both 'speeding up' and 'shrinking down'. The concept of time-space compression highlights the role of time and space in the configuration of social relations and the role social relations play, reciprocally, in the constitution of time and space. Social relations do not simply happen '*in* space and *through* time' (Castree 2009: 27, emphasis in original). Instead, social relations organize space and time—together.

The concept of 'time-space distanciation' makes less intuitive sense but highlights, nonetheless, the important, and reciprocal, roles played by what Giddens' (1990) refers to as 'time-space conquest' and 'time-space separation' in establishing the conditions for time-space compression. Time-space conquest, for Giddens, is both a scientific and a military feat. Transport, energy and communications technologies have all played a role in the removal of spatial and temporal limits on human activity, as have the cartographic and military achievements of explorers, colonizers and traders. The conquest of space and time has thus a Janus face. The de-coupling of human activity from diurnal and seasonal cycles has created new freedoms, proliferating opportunities for those who can afford them to consume, transact and move. But time-space conquest simultaneously facilitates peoples' subjugation by controlling their labour, their movement and their access to land and other resources (see also van Koppen and Bush 2018). The year-round availability of tropical fruits and vegetables in northern supermarkets (to provide but one example) is

thus partly a story about transport and logistics technologies, partly a story about migration, tourism and the evolution of more cosmopolitan consumer tastes, and partly a story about post-colonial struggles for land and control over development.

The reciprocal process of time-space separation is a conceptual feat in which time and space become absolutes (uniform, measurable and functionally discrete), disassociating our comprehension of temporality and spatiality from the times and the places in which things happen (Palitsky et al. 2016). Institutional and technological innovations including advances in measurement have facilitated the separation, objectification and standardization of time and space. Of course, such abstractions are not the only ways in which we experience time and place and nor are they entirely unique to the industrial or modern age. Nonetheless, torn apart and conceived principally as fixed quantities (as minutes and seconds, hectares and metres), time and space are emptied of meaning. They are freed from the constraints of tradition and made available for sale, exchange and creative reuse. Landscapes transformed through millennia by the cultural, livelihood and resource management practices of Indigenous peoples (to again give one example) are recast as economic frontiers characterized by underutilized natural and human resources. As empty lands and idle people. As places and times ripe for commodification.

The conquest and separation of time and space were integral to the social and technological transformations that fired the 'great acceleration' of economic activity and the subsequent compression of time and space we experience through 24 hour, global, communication and commerce. However, while abstracted notions of absolute time and space facilitate the coordination and commodification of human activity they cannot abstract those activities from their material conditions and consequences. As the Anthropocene proposition reminds us, all economic and social activity is embedded in Earth-system processes that lie within our sphere of influence but outside our sphere of control. Innumerable people have been exposed to the toxic by-products of modernity and many more yet will be exposed to the indeterminate consequences of radical intervention in the global biosphere.

Some three decades before the concept of the Anthropocene was popularized, the sociologist Ulrich Beck (1992) argued we had morphed into a 'risk society'—a society in which threats to human wellbeing caused by our

interventions in the global biosphere exceed the capacity of government and scientific institutions to understand and to manage on our behalf. Interventions such as the continued emission of greenhouse gases, the use of environmentally persistent chemicals, the destruction of biodiversity, and so on, contribute to non-linear, discontinuous and irreversible processes of environmental change—processes of unbound spatial reach and temporal duration and processes that are likely to interact to create new and unpredictable hazards (Giddens 1994). We are colonizing the future, Giddens' (1994) argues, in ways we cannot fully anticipate or control.

The future in question here includes, but cannot be limited to, the distant future. It is certainly true that the longer we maintain current patterns of intervention in the global biosphere the more that risks to human wellbeing will intensify. But it is not as though those risks will lie dormant until 2050, or the turn of the century, or some other date on which projections of average surface temperature, extreme weather event incidence, sea level rise, ocean acidification, etc. are based. The future we have colonized includes the very near future in at least two important ways. First, threats may be realized at any time. When we attempt to calculate risk, we do not seek to predict *when* an adverse event will happen but to estimate the probability of it happening *at some time*. Maybe in the distant future. Maybe tomorrow. Maybe tomorrow and then, again, the day after that. Increasing climate risk, for example, is evident both in future-oriented scenario modelling and in the growing body of evidence that extreme weather events experienced over the last decade or so have been caused or amplified by anthropogenic climate change (IPCC 2014).

Second, many people have had, or are having, their own futures redefined or cut short as a consequence of environmental change. While none of us can escape changes that are global in scale, neither exposure nor vulnerability to risks associated with environmental change are evenly distributed (Beck 1992). To some extent this is a function of peoples' own abilities to anticipate and/or respond to risk. In the aftermath of catastrophic events we routinely find that the poor, the elderly, the disabled etc. have been most severely affected (Walker 2012; Wisner et al. 2004). But exposure and vulnerability are even moreso—as environmental justice movements and scholarship have demonstrated—a function of how political and other institutions actively shape exposure and vulnerability (Roberts et al. 2018). Those already vulner-

able in one domain have more risks imposed upon them. Polluting industries, toxic waste facilities and other hazards are located in disproportionate proximity to communities dominated by racial and ethnic minorities, by poverty, and so on. Ecosystem and metabolic processes have become conduits through which violence is perpetrated on the bodies and minds of those who are already socially and economically marginal (Lockie 2016).

The abstraction of time has been but one innovation among many in the transformation of society, economy and the biosphere. Noting its importance, however, leaves a number of questions begging. Why, for example, do governments and other risk management institutions struggle to manage threats associated with environmental change? And what prospects are there to put policy and other measures in place that help to avoid interventions in the global biosphere with dangerous and/or indeterminate consequences? In the following section, we will begin to answer the first of these questions by unpacking the temporalities of social, economic and environmental change in more detail.

Conflicting Temporalities?

In the risk society, Beck (1992) argues, science and technology can no longer keep pace with the negative consequences of previous rounds of technological innovation. The authority of scientific institutions is challenged by this failure and yet we depend more than ever on science to apprehend threats that cannot be limited in time or space, and which escape our senses and imaginations. The past no longer offers an effective guide to the implications of technological change and yet this is exactly what, according to Adam (1996a), the abstracted, standardized and linear conception of time embedded in industrial society encourages us to do. Political institutions are similarly challenged since these very same threats can no longer be understood according to 'established rules of causality, blame and liability' (Beck 1996: 31). The difficulties inherent in attributing legal responsibility for global, systemic and often poorly understood hazards to individual actors leaves us in a state of 'organized irresponsibility'—a state in which those implicated in the production of hazards are largely protected from accountability (Beck 1996).

The idea that modernity is in some way redefined through this collision with its own contradictions and consequences (initiating a forced transition into the risk society or what sociologists variously refer to as late, advanced, post and/or reflexive modernity) is plausible enough as a theory of macro-social change. Mitigating and adapting to environmental change has become a staple (if not always principal) concern of governments, multilateral agencies, insurers and a host of other corporate actors concerned with the management of business risk. Yet environmental crises continue to deepen and attempts to undermine or delay substantive mitigation efforts continue to intensify.

Theorists in the Marxist tradition attribute environmental crises to the particular temporal characteristics and requirements of capitalism—the need for constant economic growth, rising labour productivity, organizational and technological innovation etc., that expand the pool of capital and accelerate its turnover (Castree 2009). In the absence of regulation, businesses are driven to maintain their competitiveness by ignoring (or externalizing) any negative social and environmental consequences that arise from the relentless pursuit of growth and reinvention. These same social and environmental consequences threaten profitability by degrading the human and natural resources on which businesses depend—producing, in principle, incentives to accept or even to impose regulation.[3] But intrinsic incentives to limit social and environmental harm are often too weak or indirect to stimulate an effective response. The more actors are involved in the production of a social or environmental harm, and the greater the distance in time or space between the perpetrator(s) and the victim(s) of that harm, the greater the incentive to ignore it. This incentive is formalized through the standard application of discount rates to evaluate the cost-benefit of investment decisions on the basis that future benefits are considered less valuable than present benefits (Palitsky et al. 2016).

But before concluding either that environmental crises are inevitable within an over-arching capitalist framework, or that such crises warrant a particular regulatory response, it is important to consider other temporal dynamics that are also here at play, including the possibility of additional conflicts (or synergies) between the temporalities of social and economic change and the temporalities of biophysical nature.

A number of theorists distinguish between social time and natural time (see Newton 2003). Elias (1991), for example, argues that while dualistic conceptualizations of nature and society are problematic, an analytical separation is needed to account for the more spatially and temporally extensive character of nature. Elias's distinction between social time and natural time rests thereby on a comparison of social change with physical processes that happen on (and indeed beyond) evolutionary and geological timescales—timescales that make even our most enduring social formations (our cultures, institutions etc.) appear youthful and perhaps transitory in comparison. Human capacity for language, learning and technological innovation enables change (both in the ways we organize ourselves and in the ways we intervene in Earth system processes) at rates that are extraordinarily fast in comparison with processes of physical evolution.

This could be seen to infer that that social time is inherently inconsistent with natural time—that unfettered social change will almost always outpace the capacity of natural systems to respond and adapt (see, for example, Bansal and Knox-Hayes 2013). This conclusion relies, however, on a one-dimensional conceptualization of nature time—a conceptualization that ignores the multiple and indeed diverse temporalities evident through physical and biological processes. While some natural temporalities do indeed play out over evolutionary and geological timescales others are abrupt, discontinuous and/or short-lived. They play out in the here-and-now, the recent past and the near future. Even the most profound social changes play out on altogether different timescales to those that govern the expansion of the universe or the movement of tectonic plates, but it is the temporal dynamics of ecosystem processes much closer to home that are of most concern here.

Agriculture, for example, represents not only the deliberate cultivation of plant, animal and other species for food, fibre and fuel, but intervention in a host of ecosystem processes that support or impede the reproduction and growth of desirable species. These interventions are as much about the speed and timing of reproduction as they are about what, and how much of it, is being reproduced. Plant growth is accelerated through manipulation of nutrient and water cycles. Animal growth is accelerated through feed and health management. Evolution is accelerated through

targeted breeding programs and the use, increasingly, of novel gene technologies. The goals of ecosystem intervention (not to mention the levels of fossil fuel input involved) might vary across different kinds of agricultural system but the need to both work within, and to influence, the temporality of physical and biological processes is common to all.

The fact that social temporalities can in any way disrupt natural temporalities shows the latter to be malleable at smaller scales. We see this all the time through changes in the hydrology, biodiversity, fertility, etc. of particular sites—changes that can be either positive or negative, rapid or slow. No ecosystem processes are entirely controllable (a product, again, of their multi-scalar character) and it is true that local and immediate actions can have global, lasting and often unforeseen consequences. Yet more than enough is known about the likely consequences (short- and long-term, local and global) of activities that impact ecosystem processes to conclude there is nothing inevitable about the incommensurability of social and natural time at scales relevant to human wellbeing. There is a great deal we do not know yet, for example, about the relationships between cultivated and uncultivated species present on our farms, and yet we do know that managing agricultural land in such a manner as to deliberately increase its biodiversity reduces pesticide use and increases production (Lockie and Carpenter 2010). Similarly, there is a great deal we do not know about how anthropogenic climate change will effect precipitation, temperature etc. at very small scales, and yet we do know that rising atmospheric concentrations of carbon dioxide and other greenhouse gases increase climatic instability and risk (IPCC 2014).

The contrast Adam (1998) draws between the linearity and uniformity of industrial time and the rhythmicity and seasonality of ecosystem processes is illustrative of the diversity and, at times, fluidity of nature time. While industrial time assumes endless repetition of functionally indistinguishable and interchangeable units of time, rhythmicity speaks to the interplay of order and pattern, on the one hand, with unpredictability and transformation, on the other. Life on Earth, according to Adam (1998: 76) is 'orchestrated into a symphony of rhythms of varying speeds, durations and intensities'. Each movement contains the possibility of change, of not producing exactly that which preceded it. At the same time, each movement is constrained by the

potentialities embedded within what came before. Time marches on but the complexities, potentials, threshold effects and multiplicity of scales implicated in ecosystem processes always contain the seemingly contradictory possibilities of reproduction, evolution and rapid systemic change (see also Harvey 1996). Indeed, systemic transformation at one spatial or temporal scale may simply reproduce long-established patterns at another. 'Species evolve, migrate, (dis)appear. Waterways dry out, flood, shift course' (Lockie 2014).

Adam (1998) argues that the temporality of industrial society undermines the Earth's capacity for self-renewal and that it is the foundations of this creative capacity (as opposed to ecosystem preservation or resource conservation per se) that we need to sustain. This argument is overtly sensitive to the multiple temporalities of ecosystem processes and yet is surprisingly insensitive to the multiple temporalities of the social. Technological innovation is portrayed as critical to the maintenance of what Adam refers to as the 'industrial way of life' but, in the absence of detailed analysis of the multiple and potentially competing temporalities embedded in specific processes of both technological and institutional innovation, industrial/clock time becomes a blunt and undifferentiated focus for well-worn critiques of science and technology. Yet technology, as Wajcman (2009) notes, can have multiple and at times contradictory temporal impacts. If we really are to open the black box of time—to expose the implicit temporalities embedded within innovation, technology, production, exchange etc.—then it follows we must consider the tempo, timing and rhythmicity of change in social and ecosystem processes alike (see Adam 1996b).

Theorists, again, in the Marxist tradition contend that no meaningful environmental or social reform is possible within a capitalist social formation (see Castree 2009; Stuart 2016). That the reproduction, circulation and growth of capital will always be prioritized to ward off economic crisis. That social and environmental harms will only ever be addressed to the minimum extent necessary to maintain the legitimacy of the political and economic order. Again, there is a degree of plausibility to these arguments. The endless cycles of destruction and reinvention deemed characteristic of capitalist development recall the linear temporality Adam

associates with the industrial way of life and, too often, the empirical failures of social and environmental policy. But to assume these outcomes are inevitable is to accept a specious and potentially dangerous argument—an argument that explains away possibilities for progressive reform by implying that whatever we do to address environmental and social crises will only forestall or deepen them unless we transition to some kind of post-capitalist society. Policy failures are interpreted as evidence in favour of these propositions, while policy successes are dismissed simply as evidence of forestalling.

Sustaining the Earth's capacity for self-renewal and creativity does suggest substantial remodelling of economic activity to better reflect the regenerative character of ecosystems and ecosystem processes. Numerous conceptual frameworks have been developed in order to support such a remodelling. Industrial ecology, agroecology, biological economies and ecological modernization, for example, each try to capture the possibility of mimicking, in some way, the dynamics of temporally stable ecosystems through all domains of production and consumption. Ecological modernization is unique among these concepts in examining too the institutional and political changes necessary to promote such reform (Mol et al. 2014). Theories of ecological modernization are critiqued for the failures of environmental policy but many such critiques rely on the assumed temporality of capitalist development outlined above (for a summary of critiques see Mol et al. 2014).

How then are we to unpack the black box of time in a manner that contributes to the understanding and resolution of contemporary social-ecological challenges? How, following Adam (1998), are we to expose the temporalities embedded within knowledge practices in a manner that incorporates the tempo, timing and rhythmicity of change in the one moment of analysis? The first step, it is argued here, is to set aside pretentions of macro-social explanation and to concentrate instead on how specific attempts to enact environmental governance embody and project their own temporal understandings and interventions (see also Lockie 2014). We pursue such a project in the rest of this chapter through exploration of temporalities embedded in climate policy.

The Conflicting Temporalities of Climate Policy

The United Nations Framework Convention on Climate Change (UNFCCC)—which entered into force in 1994—provides a legal and institutional infrastructure through which countries negotiate and report on their contributions to climate change mitigation and adaptation. The Convention establishes an 'ultimate objective' of stabilizing atmospheric greenhouse gas (GHG) concentrations at levels that prevent dangerous interference in the climate system. It goes on to state that these concentrations should be reached over a timeframe that allows ecosystems, agriculture and economies to adapt, and that action must be taken regardless of scientific uncertainties. A sense of urgency thus underlies the Convention which has contributed historically to a prioritization of mitigation actions over adaptation. The faster we mitigate, the less we need to adapt. The sooner we cap atmospheric GHG concentrations, the more likely we are to avoid dystopian futures suggested by a number of climate change scenarios.

Agreements negotiated through the UNFCCC are informed by climate assessments produced independently by the Intergovernmental Panel on Climate Change (IPCC). Assessment reports consider, among other things, observed climate change, the causes of climate change, projected climate change (based on low, intermediate and high-emission scenarios), the implications of these projections (including their social impacts), and opportunities for mitigation and adaptation. While consideration of social impacts and adaptation has increased since the first assessment report in 1990, IPCC climate projections continue to dominate international negotiations—the 2017 UNFCCC Paris Agreement[4] being a case in point which commits signatory countries to limiting global temperature rise this century to well below 2 degrees Celsius above pre-industrial levels.

Targets such as this are informed by global climate models which 'extrapolate the implications of various atmospheric GHG concentrations for climate change (including temperature, precipitation, sea level and extreme events), and thence for ecosystem and human well-being'

(Lockie 2014: 102). Climate models and the scenarios they test are powerful tools for climate governance but they are also relatively insensitive to threshold effects or tipping points; that is, to the known possibility of abrupt and irreversible change in climate and other Earth system processes (Clark 2010). While significant uncertainty over the precise concentrations of GHG sufficient to trigger abrupt and irreversible change (IPCC 2014) suggest even greater urgency is required in the mitigation of GHG emissions, the models and scenarios on which international agreements are based suggest a more temporally linear process of gradual and incremental change (Clark 2010; Lockie 2014). Policy and programs developed in response to agreed targets might consequently be designed with at least two temporally-focused questions in mind. Is the pace of implementation likely to be sufficient to keep pace with the expected pace of climate change? And are policy and programs flexible enough to be accelerated, augmented or reconsidered in the event of unexpected climate dynamics?

Importantly, while the UNFCCC has established greenhouse gas accounting protocols and implementation mechanisms to help countries meet their commitments (for example, by trading emission credits or providing finance) it does not determine how these commitments should be met. Climate policy is a matter for individual jurisdictions. The rest of this section thus explores how policy-makers in three countries—Australia, China and the United Kingdom—conceive the temporal dynamics of climate change and how, they believe, policy should be designed in response to these dynamics.[5]

Analysis of interview data shows that policy-makers were overwhelmingly of the view that market-based mechanisms for reducing GHG emissions—such as emission trading schemes—ought to be strengthened in order to tackle the inter-related problems of *rent-seeking* (businesses securing financial benefits through their influence on climate politics and policy), *emission displacement* (the use of trading schemes to avoid taking reasonable action to reduce emissions) and *investment strikes* (withholding or deferring investment in low emission technology due to frequent policy changes). Underlying each of these problems

were, policy-makers believed, serial policy compromises driven by short-term political imperatives.

Policy-makers expressed serious concern about the temporal robustness of climate policy but this concern had little to do with the temporal dynamics of climate change. Scenarios such as those embodied in IPCC Representative Concentration Pathways (IPCC 2014) received scant mention while the 2°C Paris Agreement target was seen as little more than a general guide to planning for future carbon reductions. The strengthening of market mechanisms was advocated principally on the basis that participants believed them to be more cost effective and flexible than their alternatives, in theory, but undermined by multiple politically-motivated compromises, in practice. In China, these compromises included a lack of transparent and accurate baseline emissions data and a lack of participation in trading schemes by State Owned Enterprises. In Australia and the UK, compromises included the allocation of free emission permits or credits to major carbon polluters. Participants from all three countries discussed Australia's abolition, in 2013, of its national carbon pricing mechanism and attempts to abolish several other climate programs.

Policy-makers believed that climate policy calibrated to short-term political demands was rewarding rent-seeking behaviour among businesses and discouraging investment. Short-term compromises were roundly blamed for the EU carbon price crash of 2013 and identified as an ongoing barrier to genuine emission reductions. As one participant from a green bank in the UK expressed, decisions on carbon credit allocations and a new reserve were not based on what is most scientifically (or even economically) rational:

> To be honest … it doesn't look very evidence-based from what we've seen. And as much as anything, it looks like the thresholds [for the carbon credit reserve] that they've proposed are compromises between those who really are very worried about the oversupply situation and would want to see a lot of allowances taken out, and the industrial sectors, the energy-intensive sectors who are worried that too many will be taken out and then of course the price will jump up too much. So the thresholds

they've proposed look more like political compromises as opposed to soundly economics-based.

In short, synchronizing the temporal dynamics of carbon policy instruments with those of the political sphere was of greater concern than synchronizing either with processes of climate change. Policy-makers were focused on incremental improvement in the design of market mechanisms in order to make them work for politics, and vice versa, rather than on how to re-work either market mechanisms or political processes in order to make them work for climate change. Indeed, one of the most curious features of interviews with policy-makers was how little the temporal constraints of climate change figured in their thinking. Participants struggled with questions such as how much time may be left to deal with climate change and how temporal uncertainties affect their own decision timeframes. Even those who felt that time was 'running out' seemed reluctant to reflect at length on how they ought to respond. The priority goal for almost all participants was that of stabilizing policy in order to provide a favourable long-term environment for investment in lower-emission technology and infrastructure.

Importantly, synchronizing carbon policy instruments with the demands of the political sphere was complicated by the multiple (and competing) temporal demands in play. By way of example, Table 15.1 summarizes competing temporal dynamics across the policy, insurance and finance sectors. While all sectors deal with multiple temporal dynamics and demands, participants in this research emphasized the over-riding importance of three to four-year electoral cycles, business and product lifecycles, regulatory reporting timelines and investment horizons. The different timeframes that each sector operates within intersect with each other, sometimes resulting in decisions in one sector that undermines the other. These market, electoral and business cycles also create internal logics within each sector that do not incentivize longer-term thinking, and thereby, longer-term decision-making. As one participant from a carbon trading company in the UK lamented:

Table 15.1 Decision-making timeframes in the policy, insurance and finance sectors

Sector	Type of decision	Timeframe	Influencing factors[a]
Policy	Government policies and programs	3–4 year electoral cycle	• Winning elections • Public perception • Domestic political climate • Global political climate • Cost • Data; evidence base; technology
Insurance	Pricing of insurance products	Annual	• Rapid urban development • Development in high risk areas • Access to data (e.g. flooding, cyclones, earth quakes, etc.) • Competition with competitors
Green Finance	Investment	Decadal investment returns Quarterly to yearly (financial reporting timelines)	• Changes in government policy • Projected price variations, future costs, supply and demand, etc. • Investor expectations; employee bonus cycles

[a]The factors listed here are those identified by research participants and should not be considered exhaustive

> we are trying to take political steps to solve something which unfortunately, politics does not resolve because it's [referring to climate change] so long-term … I think the instrument of politics is not very well suited to such long-term issues … I'm trying to be very realistic. Nobody will get elected on a campaign that [long-sighted] … not even 10 years … that's why we're in the situation that we are where nobody is doing anything.

However, it is not just political systems that engender short-term thinking but also market and business systems. As another participant from a similar sector in Australia commented:

> The CEO's bonus cycle is 12 months … he's not gonna get a bonus for establishing or putting the corporation on a nice path that in 20 years it'll

> look better. He'll get a bonus if he can increase the dividends of the company. And he's also got a stock option. So, he only cares about the short-term share price. And the short-term share price … the average shareholder holding shares for less than three months ain't gonna be worried about what is the price of those shares in 20 years time.

While well-designed market mechanisms hold forth the promise of accelerating innovation cycles and promoting transformational change at lowest economic cost, realizing this promise is dependent in no small way on effective regulation and legitimacy (or acceptance) among stakeholders (see Callon 2009). Removing politics from climate policy is thus neither possible nor desirable (see also Wong 2012). The temporal contradictions noted here between political terms, investor expectations etc. and climate change are not easily resolved and will certainly not be resolved by delegating authority for designing and administering trading schemes or other policy instruments to a technocratic elite. Democratic deliberation over political and market reform, over social and economic expectations, over how much climate risk we are willing to tolerate, and so on, is needed before the work of synchronizing the conflicting temporalities of climate policy can even begin.

Conclusion

Humans have altered key Earth-system processes—in particular those associated with climate, biodiversity and the nitrogen cycle—to a degree that dangerous environmental transformation is considered increasingly likely; that is, if such transformation has not already occurred. Comprehending the temporality of potentially dangerous environmental changes in terms of their pace and rhythm is as fundamental to the IPCC and other experiments in Earth-system governance, as is comprehension of the spatial distribution of environmental change. However, as this chapter has argued, the goals of avoiding and/or adapting to dangerous socio-environmental transformation also require us to engage more reflexively with the conceptual frameworks, technologies and projects through which we attempt to understand and control Earth-system processes. This suggests a shift in focus for sociological analyses of time: from

the critique of modernity, to the temporalities implicit in specific attempts at enacting environmental governance and the knowledge practices that inform them.

Climate modelling and scenario building have proven to be powerful means through which to comprehend the temporality of climate change; to bring the future into the present in order to plan responses and calculate responsibilities. The purpose of interrogating such techniques and responses in this chapter has been to illustrate the partiality of any knowledge that we bring to bear on environmental problems and the associated need to maintain a constructively critical stance towards our knowledge, the conceptual frameworks with which we organize it, and the policy responses it informs. It has not been to dismiss either the techniques and responses themselves or the underlying notion of anthropogenic climate change as 'mere' social constructs; this would be neither insightful nor useful.

The other crucial point revealed in the empirical section is that techniques of climate modelling and scenario building alone are not sufficient to change the temporalities of markets and political systems. They may have done well to reveal the temporalities of climate change and enable us to put broad timeframes for responding and taking action but, it is important to remember, facts do not speak for themselves. Neither climate models nor scenario building can tell us what values we should prioritize, what sacrifices we should and are willing to make for future generations, and what risks we should and are willing to accept. In short, these techniques tell us nothing about how policies should be designed and which policies will be acceptable to the public. And as the empirical section revealed, the models and techniques used to shed some light on the temporalities of climate change seemed to have had little influence on decision-making processes in key sectors involved in climate policy.

There is a great deal that we do not know yet about how much time exactly we have to take action and how anthropogenic climate change will play out at the local, national and global scales. Yet, we know enough to know that we must act now and that we are running out of time. And while we have come a long way in developing more sophisticated technologies, techniques and devices to make the multiple temporalities of ecosystems processes more visible than ever, we have not yet adequately grappled with the challenge of synchronizing these newly visible ecological temporalities with the multiple temporalities of the social.

Notes

1. We should note here that physicists have long rejected the idea that time is absolute. While the origin and nature of time is now subject to considerable debate, the general theory of relativity, quantum theory and cosmology all point to a phenomenon that behaves in counter-intuitive ways at scales, such as the sub-atomic, that lie beyond our immediate experience (Merali 2013).
2. The social life of time is consequently a consistent theme in fields such as criminology, gender studies and the sociology of work.
3. Governments are one kind of institution among many involved in environmental governance. Non-state actors seek both to implement the regulatory activities undertaken by governments and to enact their own regulatory activities. Many retailers and other lead firms are active, for example, in the regulation of environmental and social performance through their upstream supply chains in order to minimize risks associated with the activities of other businesses (Boström et al. 2015). State and private regulatory frameworks often intersect to form hybrid systems of governance believed to offer more flexibility and lower costs than exclusively centralized or 'top-down' systems (Lockie et al. 2015).
4. See http://unfccc.int/paris_agreement/items/9485.php.
5. Material in this section is drawn from the project *Conflicting temporalities of climate governance: a comparative sociology of policy design and operationalization in Australia and the UK*, conducted with financial support from the Australian Research Council (DP130104842). Semi-structured interviews were conducted with over 70 public and private sector climate policy-makers in Australia, China and the UK between October 2014 and June 2015. Interviews were audio recorded with consent on condition of anonymity, transcribed verbatim and analyzed using the inductive method of thematic analysis.

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16

Conclusions: A Proposal for a Brave New World of Conceptual Reflexivity

Magnus Boström, Debra J. Davidson, and Stewart Lockie

Your beliefs become your thoughts,
Your thoughts become your words,
Your words become your actions,
Your actions become your destiny.

These verses from Mahatma Gandhi largely capture the premise for this volume, although we might replace 'your' with a collective 'our', and emphasize the bi-directional relations between the verses. Environmental

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social scientists must work proactively to facilitate learning, by acknowledging and enabling the knowledgeable, competent, and reflexive efforts by a variety of actors in our contemporary, global society. Learning for environmental change will have to engage all levels and spheres of society, confronting issues of structural inertia, cultural ignorance and conflicting societal interests. Crucial questions entail how individual and collective actors, lay persons and experts, develop the reflexive capability to promote change, and counteract structural and cultural forces that prevent change.

In confronting these questions, the contributors to this volume share a desire to open boundary-spanning dialogues on the environment-society concepts that influence scholarship and practice. Our intention is not solely academic. Our hope is that such dialogues can serve to support societal efforts to confront environmental crises. On a more personal level, as the environmental sciences, including the social sciences, have been singled out as targets of anti-reflexivity and post-truth forces, the direct engagement of scholars in confronting denialism has become necessary for the sake of defending our own legitimacy.

In this concluding chapter, we elaborate on denialism and its confrontation. Following this, the authors of this chapter offer our own critical reflections on the concepts explored in this volume, by returning to the three questions raised in the introduction: what is the explanatory value of these concepts? What biases and blinders are embedded within them? And perhaps even more importantly, what sort of action-orientation have they, or are they likely to, inspire? In the third section, we draw out one of the most important, and common themes in our chapters: the concerted need in all of our efforts to conceptualize society-environment relations to achieve a richer, more robust and sociologically-informed understanding of society and its many spheres of structure and agency. In closing, we apply our sociological imagination to explore what future(s) may lie ahead.

Confronting Denialism

Discussions of our prospects for constructive changes in environment-society relations quickly shift to the reigning influence of anti-reflexivity in the politics of climate change and the environment today. This trend

expresses itself in the rising popularity of conspiracy theories, the discrediting of news and information, the creation of fake news, and intimidation of many spokespersons, particularly environmental scientists. This is referred to as 'post-truth politics' (see Lockie 2017a). The idea of post-truth politics, says Lockie, is more than picking-and-choosing among relevant facts and making questionable interpretations of facts produced by others in order to support one's beliefs. Rather, 'the post-truth politician manufactures his or her own facts. The post-truth politician asserts whatever they believe to be in their own interest and they continue to press those same claims, regardless of the evidence amassed' (Lockie 2017a, p. 1). Their efforts have certainly not been in vain: anti-reflexivity forces have succeeded in establishing a bias towards climate skepticism in both government agencies and media reporting in many countries. Edvardsson Björnberg et al. (2017 p. 239) conclude: 'research conducted on environmental science denial in the last 25 years shows that denial indeed has a significant negative impact on societal debates and decision-making.'

While non-reflexivity refers to a lack of reflexivity, anti-reflexivity refers to its purposeful, outright rejection (McCright and Dunlap 2010). Anti-reflexivity entails deliberate efforts to prevent change by challenging reflexive forces, such as scientific information. Anti-reflexivity requires a significant investment of knowledge, and indeed reflexivity, as well as expertise in information and communication technologies, to ensure that powerful decision-makers remain misinformed and unreflexive. These efforts are pursued by many types of actors, sometimes in coalition, including scientists, governments, business, media, political and religious organizations as well as the larger population, and these coalitions appear in different guises in different countries (Edvardsson Björnberg et al. 2017). Climate denialists' ability to misrepresent other actors, scientists and scientific information all require concerted attention to those actors' discourses, worldviews, claims and sources.

A critical resource for anti-reflexivity forces is public ignorance, and thus an overt strategy employed to maintain legitimacy is to keep publics in a state of confusion and ignorance. Their success in doing so amounts to elimination of the prerequisites for publics and decision-makers to make deliberate and sound decisions. But structural forces can also play into the hands of denialists. Denialism can easily grow among people in harsh conditions (Edvardsson Björnberg et al. 2017, p. 236). Various

forms of discrimination and environmental injustice have had the effect of blocking reflexivity and paving the way for anti-reflexivity forces. Scholarship on environmental justice (see Roberts et al. this volume) and environmental democracy (Fischer, this volume) have drawn attention to the links between, for example racialized social experience, environmental inequalities and (dis)engagement in politics. These work clarifies that denialism and its obverse, reflexivity, are not just matters of knowledge, they are matters of in/exclusion from civil society and the public sphere: the opportunities people enjoy to take part in deliberations about the wider circumstances that shape their lives.

Efforts to challenge denial often tend toward calls for more of precisely what is denied: science. Calls for more information, more data, more education, more communication certainly warrant heeding, but they also run the risk of further validation of denialists, when the Holy Grails of scientific certainty and objectivity are not (and never will be) realized. What is needed in equal measure is more reflexivity in and of science, and in and of our political discourses (see, e.g. Edvardsson Björnberg et al. 2017; Lockie 2017a). The confronting of denialism requires not just building, supporting and defending credible environmental expertise but also the democratizing of science and knowledge (Lidskog & Sundqvist, this volume, Fischer, this volume, Lockie 2017a).

In this regard, concepts are central. Denialism is fed by the privileging of a narrow set of ideologies and discourses. Reflexivity, on the other hand, is fertilized by the pluralization and conscious deliberation of the same. Likewise, denialism thrives on insensitivity to the interconnectedness of societies and ecosystems along both temporal (past, present, future) and spatial (local, regional, global) dimensions, and the discarding of anything that cannot be directly observed. Supporting open, critical discussions of concepts, however, invites plurality, and sensitivity to those interconnections and hidden processes. All concepts referred to in this book provide sensitivity to both interconnected and hidden processes to varying degrees, and as we elaborate upon in the next section, contemplating these prevailing concepts in tandem can aid in clarifying their respective explanatory value, biases, blinders, and action-orientations, and in some cases complementarity; it can encourage actors to avoid conceptual traps (see Chap. 1); and can also create openings for conceptual

cross-fertilisation through transdisciplinary dialogue. Reflexivity requires communication between, and not just within, discourses (Stevenson and Dryzek 2012), and such communication in turn requires the humility to scrutinize both one's own favoured concepts as well others (Fischer 2003; Boström et al. 2017).

Conceptualizing Environment-Society Interactions for an Interconnected World

As Lidskog and Waterton (2016) note, concepts are navigational, normative and performative. Concepts direct our attention, encourage particular courses of action and, in the process, help re-shape the world in their own image. If there is thus one point we hope all readers take away from this book, it is that concepts have implications. As noted in the introduction, concepts have a double hermeneutic quality—informing our understanding, influencing our action and changing, as a consequence, the very phenomena in which we are interested. There is hence a two-way relationship between concepts in science and society. This double hermeneutic quality is particularly germane today, given the globalized and interconnected character of contemporary environment-society relations, and the increasing urgency associated with numerous forms of environmental disruption.

Some of the concepts reviewed in this book are primarily navigational. Others normative. Noting these emphases is important in assessing the explanatory value, potential limitations and action orientation of each concept. Scholars bear responsibility for critical evaluation of the concepts we use but, in doing so, it is as important we highlight what those concepts do well as much as it is we examine their limitations and weaknesses. Concepts are tools explicitly intended to aid in an actor's ability to comprehend aspects of the world around him or her, and yet all concepts inevitably reveal certain aspects of that world while concealing others. So, goes the popular adage: all concepts are wrong, but many are useful. Each of the concepts reviewed here is necessarily partial and ambiguous, and complements or conflicts with others to varying degrees. Such partiality, ambiguity and plurality can have deleterious effects. For example,

according to Pellizzoni (this volume), the wide varieties of so called 'sharing economy' experiments today make the sharing economy a conceptual swamp. On the other hand, that same conceptual messiness, when scrutinized and discussed, can stimulate scholarly debate, supporting pluralism, and cross-concept fertilisation.

Raising the stakes, the concepts reviewed in this volume have entered into political parlance to varying degrees, and thus biases and blinders have implications far beyond the academy. Consequently, one of the most important aspects of reflexivity is a persistent questioning of the assumptions embedded in our concepts. Assumptions are inevitable. Rather than aspire toward the goal of 'bias-free' concepts, a more fruitful approach is to acknowledge those biases and subject them to critical reflexivity, and challenge the tendency toward dominance of any single concept.

A concept's implications manifest most importantly in the actions, or engagement, that they inform. Because our societies are complex and thus the outcomes of any process are emergent, the actions that evolve from concepts cannot be predicted in their entirety. Concepts such as tipping points, planetary boundaries, the great acceleration and the hockey stick may incite fear, tragedy and/or sense of urgency, and thus may mobilize action among some, or create impotence and cynicism among others. Other concepts may induce not fear but hope, irritation, or anger, leading to a different set of actions. Others may inspire, even motivating lifestyle changes and substantive social experiments like sharing economies (Pellizzoni), climate justice movements (Roberts et al.), voluntary downscaling and de-growth (Rau), or transboundary organizational partnerships (Mol). We next re-visit the concepts explored in this volume to assess their explanatory and performative power.

The Explanatory and Performative Power of Concepts

The **Anthropocene** and the related notion of **planetary boundaries** offer excellent examples of concepts that are explicitly navigational, normative and performative. They have been criticized by social scientists on the basis

that their ability to explain or inform the processes of cultural, political and legal reform they are intended to stimulate (see Steffen et al. 2007) is undermined by simplistic, or reductionist, assumptions about the social realm (Lidskog and Waterton, this volume). Ostensibly statements of fact concerning the scale and implications of human influence on the biosphere, the Anthropocene and planetary boundary concepts tell us little we did not already know about, for example, climate and biodiversity and even less about the social relations responsible for rising levels of resource use (Lockie 2017b). Yet the Anthropocene has become an increasingly ubiquitous narrative in scientific literature and communication—as Lidskog and Waterton illustrate through their virtual tour of recent museum exhibits on the topic. Within the academy, Lidskog and Waterton suggest the concept 'may be an important vehicle for increasing boundary-crossing between disciplines and for centring debates more firmly on social-environmental dynamics.'

Despite its popularity among scientists, however, the Anthropocene concept appears to offer limited potential to inform effective, policy-oriented action, or to mobilize citizens, given its poor theorization of social structure and agency. The Anthropocene concept embodies a recognition that humans are a driving force of environmental change but offers no parallel recognition of social and economic inequality, how it is produced, or why inequitable and unsustainable relations endure despite the threats associated with them. Lidskog and Waterton warn 'there is a risk that the Anthropocene narrative will embrace a simplified and over-rationalistic view of agency that does not take into account how different contexts enable and constrain social actions.' Even more worrying though, are the implications of the depiction of this rather homogenous black box as an inherently negative geological force. At best, human actors appear impotent. At worst, they become a plague, justifying draconian and undemocratic responses to environmental crises.

Researchers working with the concept of **socio-ecological metabolism** provide a more sophisticated and nuanced explanation for the interactions between environment and society, defining those relations as historical, interdependent and co-evolving. The Effort Factor expands upon this opening with attention to historic declines in the quality of material resources, avoiding the tendency to treat natural resources, and

the environment generally, as a static domain that is 'acted upon' by society (Davidson, this volume). Many adherents also incorporate sociologically-informed accounts of the social sphere. Particular attention is paid to the structures of capital and technology, in contrast to the majority of concepts in play in environmental discourse today, which tend toward more individualistic treatments of the social sphere. In doing so this concept draws attention to how inequalities are created due to spatially-delimited processes of extraction, distribution, and waste accumulation.

It is important to note that while social-ecological metabolism offers more explanatory power than that of the Anthropocene, it is not without its limits. The priority accorded material processes such as energy flows within metabolic analyses can come at the expense of non-material processes such as the production and exchange of knowledge. The structural focus of metabolic analyses of society and economy can also neglect the roles of power and agency in social dynamics (suggesting a tendency toward monocausalism). Thus, while there is considerable interest among both government and non-government organisations in the policy implications of social-ecological relationships there is scope to expand the action-potential of metabolic studies through integration with other concepts discussed here including those oriented towards understanding governance, institutions and social practices.

The concept of **risk** also adds important nuance to our understanding of threats associated with environmental change. In contrast with Anthropocene narratives (and other cautionary tales) that simply warn us against potentially dangerous courses of action, risk enables us to approach threats in a measured and deliberate manner. By calculating the probability and consequences of harm, risk assessment enables us to consider when potentially dangerous activities are acceptable and how risk can best be managed. Risk thus enables, in a very direct manner, the routine and widespread performance of hazardous activity. It is telling though, as Ylönen notes in her chapter, that application of this concept through technical risk assessments and through the sociology of risk have diverged to such an extent they bear little resemblance to each other. Social scientists criticise technical risk assessment for several important blinders including an over-reliance on expert knowledge and quantification and for a corresponding neglect of how peoples' interpretations and responses to hazards shape risk outcomes (Lockie and Wong

2017). These critiques have gained some traction among risk assessment practitioners and scholars but they remain at the periphery of the field nonetheless (Wong and Lockie 2018).

Resilience may have an equally lengthy linguistic history, but its conceptual application in environment-society discourse is relatively new. Its rapid uptake in academic and practitioner fields has been remarkable, and consequential. Similar to metabolism, resilience is a concept that was applied initially to elements of the natural world and thence extended to encompass the social sphere. Much like sustainability, the idea of resilience does not seek to explain ecological or social processes so much as it seeks to articulate the key characteristics of a relatively enduring ecological or social system. Its use as a planning tool is thus based on the *presumption* of its desirability. Ylönen (this volume) highlights a number of conceptual shortfalls however, which limit its explanatory and practical value. In particular, the need to subsume social spheres into a systems perspective results in an overly mechanistic and passive depiction of societies (ecological reductionism) that ignores inequality and the need for positive social transformations. Assumptions about system behaviour drawn from ecological systems may simply be wrong when applied to the social realm. Without a critical lens on power and equity, resilience appears to devolve responsibility for adaptation to risk to those most vulnerable.

The **global environmental networks and flows** concept departs in some ways from the preceding concepts. Its main purpose is to reflect observations of the increasingly global, fluid and complex nature of commodity chains and their environmental impact, as well as new networks and flows of political power, which make the world 'inherently complex, fluid, dynamic and uncertain,' in the words of Oosterveer. Concrete images and narratives—like the palm oil narrative described by Oosterveer—show that what is happening 'far away' is not unrelated to what is happening 'here'. In this sense, the epistemological origins of this concept translate into particularly high explanatory value, and provides a much-needed corrective on many elements of the epistemological rule books from which researchers in the environmental social sciences draw. This concept provides us with a better comprehension of the global-local interactions among actors, institutions, ideas, and information. As Oosterveer argues, 'this perspective allows for better conceptualisation of

the emerging global environmental governance arrangements with their flexibility, dynamics and adaptability.'

While the concept ostensibly encompasses both social and environmental processes, to date it has been applied to the social sphere to a much greater extent than the environmental, and thus this concept does not (yet) offer a well-grounded explanation of flows of materials and environmental impact. Integration, consequently, with concepts like social-ecological metabolism would be fruitful. At the same time, it is important to acknowledge the many practical innovations in trans-national governance that Oosterveer and others highlight in their research. Private businesses, non-government organisations and state agencies have all been active in the development of, for example, standards, verification and audit procedures, and labelling schemes designed to facilitate material flows through local and global networks while regulating their environmental and social performance. Drawing attention to the dynamic and complex character of environment-society relations can very clearly motivate innovations in governance, alliance-building and collaboration that accommodate rather than ignore such complexity.

The idea of the **environmental state** is rooted in a much older social-scientific tradition that relies on nation-states as units of analysis, focusing in this case on the development of state-based institutional and regulatory arrangements for environmental protection. As an explanatory tool, it is important to acknowledge that state-building has never been a globally homogenous enterprise and that many analyses of government-led environmental reform reflect European experiences. Mol in his chapter notes that the concept of the environmental state has been questioned given the expansion of global networks and flows—a phenomena that both challenges governmental authority and allows for environmental degradation to be exported to less regulated economies. However, the shifting of authorities implicated in globalisation does not spell the end of the state but the emergence, rather, of more complex and networked forms of governance (as the networks and flows perspective suggests). Governance may no longer be restricted (if it ever was) to ideal-type authoritative and autonomous states ruling over well-defined territories but the **environmental state** concept may play a useful performative role

by informing debate around the legitimate roles of states in addressing complex socio-environmental problems.

A number of attempts have been made to replace the environmental state concept with that of **environmental governance**. These reflect 'moves away from nation-state centric ideas of regulation and administrative power in governing the environment, and points towards political power and authority at multiple levels (local to global) and across different geographical scales.' As an explanatory concept, environmental governance is consistent with the idea of the environmental state—albeit noting an increasingly complex regulatory landscape in which more actors seek to influence the activities of others. However, there is a normative dimension to many conceptualisations of environmental governance that promotes a 'positive rhetoric of inclusiveness, collaboration, transparency, redistribution of power, and equity' and thus a deliberate marginalization of state authority (Mol, this volume). Mol's chapter suggests caution in pushing either explanatory or normative conceptualisations of environmental governance too far given states remain substantial sources of territorial authority and, by extension, the need for states to continue to play a central role in addressing environmental issues. Again, referring to Mol, 'environmental states and state authorities are fundamentally rather than marginally different from other (private) actors and authorities with respect to, for instance, environmental accountability, control of territory, rule-altering behaviour, democracy and citizenship, and balancing interests.'

The concept of **economic valuation** seeks not to explain but to prescribe socially optimal courses of action based on models of human and market behaviour drawn from the discipline of economics. Ecosystem processes are defined principally as 'services' to which monetary values may consequently be assigned. Many scholars have highlighted the dangers of such reductionism, however well-meaning and pragmatic its adherents. Those features of ecosystems that are not recognized for their service value to humans are relatively ignored, as are the rights of future generations since discounting ensures a higher value is accorded to consumption today than to scarcity tomorrow. **Economic valuation** can inform policy innovation and encourage conservation of over-exploited scarce resources such as water, but this concept also risks validating (or at least a failing to

challenge) powerful forces of ecological disruption such as marketization and commodification. Yearley's discussion of the performativity aspects of economic valuation highlights 'the ways in which economic discourse has been put forward as the authoritative and universal way of expressing the value of environmental goods and benefits', in the process marginalising values that cannot be expressed in economic terms.

Lidskog and Sundqvist discuss how the uncritical uptake of the concept of **environmental expertise** establishes boundaries and hence the privileging of 'experts' versus non-experts. However, applying a critical lens to environmental expertise highlights the plural and inevitably partial nature of environmental knowledge, and thus 'there is a need to include manifold understandings of the environment, involving different kinds of expertise (including social sciences), in the shaping of environmental problems. There is no universal expertise relevant for all kinds of environmental problems—but there is also no one specific expertise for a particular environmental problem.' Analogous to social practice theory, social scientific engagements with the concept of **environmental expertise** constitute a challenge to earlier, uncritical accounts of environmental experts as privileged, objective, and effectively asocial elements of environmental decision-making. They encourage a more reflexive understanding of the role of science and scientists, and what constitutes legitimate knowledge for inclusion in decision-making. The pluralization and contestation of scientific authority encouraged by such conceptual inquiry create conditions for sound scepticism of science, but anti-reflexivity can also exploit these tendencies in favour of an over-reaching relativization. Uncritical acceptance of prevailing, scientistic views of environmental expertise (Lidskog and Sundqvist), on the other hand, privilege particular voices and information, and marginalises others. Ylönen, in the chapter on risk and resilience, offers a related caution in relation to probabilistic risk assessment, which tends to be the exclusive domain of 'experts'. Yearley does the same in the chapter on economic valuation.

There is no doubt that a good many people do engage in **green consumption** practices and that supply chains, certification schemes, policy frameworks, and so on, have proliferated with a view to enabling and directing these practices (Boström et al. 2015). Assessing the environ-

mental impacts of green consumption practices, and the effectiveness of strategies to promote green consumption, are valid empirical questions. The normative application of green consumption, however, introduces conceptual limitations. Specifically, a narrow gaze on the consumer is biased by a reductionist and over-elastic account of human behaviour. As such, it overlooks the industrial and state drivers of environmental degradation while, at the same time, failing to problematize the role of mass consumption in environmental degradation. Used normatively, green consumerism devolves blame to individuals while prescribing more consumption (and no other action) as the solution to environmental crises.

Huddart Kennedy and Hauslik advocate use of **social practice** theory to develop socially richer accounts of material consumption that account simultaneously for agency and structure; for consumer knowledge, skills and desires, on the one hand, and for enabling infrastructures, institutions and supply chains, on the other. The epistemological shift from focusing on individual consumers as units of analysis to practices, or constellation of practices, in which myriad actors and relationships are implicated greatly enhances the explanatory value. Huddart Kennedy and Hauslik argue this shift opens new opportunities to perform green consumption through reform of state and corporate practices and through promotion of a more civic and creative environmentalism that engages with the routines and habits over everyday life.

Sustainable development, or sustainability, is the primary way in which we conceive of desirable social and ecological relations—the goal of green consumption, the environmental state, and so on. Ambiguity over what sustainability is, in practice, has encouraged the development of cognate concepts such as **resilience** (Ylönen, this volume) and **environmental justice** (Roberts et al. this volume). Nonetheless, it remains the case that it is difficult even to think or talk about social and environmental futures without reference to sustainability. To be sure, sustainability has limited explanatory potential and it is, indeed, attempts to quantity and measure sustainability that attract the most sustained and convincing critiques. In her chapter, Rau shows how the translation of abstract, distant, long-term, future-oriented goals into measurable indicators through sustainability assessments and indexes privileges an overly narrow and technocratic expertise and prevents opportunities for participation by citizens,

communities and many NGOs. The explanatory value of sustainability is particularly constrained by its dualistic articulation of economy, society, and environment as separate (albeit inter-dependent) systems. By placing economic, societal and environmental sustainability on equal normative footing there is considerable potential to ignore conflicting interests and goals (ICSU 2017). Depending on the level of analysis, there are a number of concepts with rather more explanatory power, suggesting attempts to operationalise sustainability ought to draw on these concepts.

Importantly though, sustainable development did not originate in an effort to offer explanatory value but to motivate transformational shifts in policy, planning and practice. It has been remarkably successful in promoting conflict resolution and collaboration among stakeholders, but has had more limited success challenging the power structures highlighted by other concepts reviewed in this book (e.g. Davidson, Pellizzoni). The United Nations' 2030 Agenda for Sustainable Development and associated requirements that member states report on a diverse (and 'indivisible') set of indicators and targets may be seen as an attempt to reinvigorate sustainability's transformative potential. For this purpose, Rau offers a much needed contribution through the notion of 'practice-oriented sustainability assessment', which she argues 'provide fresh impetus for the development of more accessible and inclusive sustainability initiatives and assessment tools that are co-designed by citizens, communities, scientists and policy-makers.'

Environmental justice zeroes in on some of the conflicts glossed over by sustainable development accounts—most importantly disproportionalities in exposure to environmental hazards (and in access to natural resources) associated with historic social divisions based on race, ethnicity, class and/or gender. Roberts et al. demonstrate, in their chapter, how the scholarship on environmental justice provide important explanations why environmental injustices exist, providing economic, socio-political and racial discrimination explanations. Even more importantly, environmental justice is without doubt among the most powerful of the concepts reviewed when it comes to motivating social action. The history of environmental justice as an academic concept, after all, coincides with the history of environmental justice as a social movement frame, one that has proven resonance with a broad segment of marginalized and otherwise

isolated groups. Environmental justice effectively directs our gaze beyond material and technocratic dimensions of society-environment relations, and toward the deep and often hidden interconnections between environmental degradation and human rights, power asymmetries and disproportionalities.

Environmental democracy expands upon the resulting mobilisation to offer a framework and tool for inclusion of environmental wellbeing, and even future generations and nonhumans into democratic principles. Like several other concepts (e.g. sustainable development) there is a certain fuzziness and interpretative flexibility inherent in this concepts. It is an 'essentially contested concept', and in his chapter Fischer discusses both liberal and radical variants of democratic theory. The concept and debates guided by democratic theory have an obviously important normative value, but it is important not to forget the potentially useful explanatory value as well. That is because scholarship has a role to play in studying how democratic governance causally relate to environmental reform. This connects also with a performative value: democracy is fundamentally about a way of problem-solving. For instance, Fischer describes the actions informed by the concept of environmental democracy in eco-villages: 'Although consensus-based environmental democracy is time consuming, it is seen to lead to just and informed decisions that, after being made, are more easily and effectively implemented. By giving all members the opportunity to think through and voice their concerns, otherwise hidden issues come to the surface and addresses in advance of concerns that can later come up and be problematic' Similarly, Pellizzoni provides a number of examples in which social actors are already taking up initiatives informed by the concept of the commons, including numerous experiments in sharing economies, local currencies, and other forms of 'commoning.'

In many ways, **the commons** concept provides a highly complementary approach to analysis. Pellizzoni illustrates the wide explanatory value of **the commons**, with both socio-material and immaterial (knowledge) applications, suitable to the analysis of phenomena as varied as land grabbing practices and sharing economies, biotechnology patenting and seed banks, all of which describe processes that lead to new commons and new enclosures. Each of these phenomena describe struggles among actors

with different levels of power to assign access and exclusion. Of particular note is the extension of this concept to active social processes of 'commoning work.' The concepts of the commons and 'commoning' are particularly effective at drawing attention to the agency and process character of social efforts to create and acknowledge commons, capturing geographical, ecological, political, cultural, cognitive, historical, juridical, and economic elements into the socio-material assemblages. The commons concept is also one of the concepts reviewed in this volume that most explicitly focuses its gaze closely on that interactive space *between* society and environment.

Two other chapters are unique in that the authors do not focus on a single concept, but rather draw attention to the relative *lack* of explicit conceptualization of two entities which are nonetheless absolutely critical to environment-society relations: space and time. In both these chapters, the authors highlight the incongruence between 'social' space and time, and the spatial and temporal dimensions of ecological processes. They reveal persistent blinders and biases that tend to result among social systems that have adopted human exemptionalist worldviews. Geological, biological and ecological expressions of space and time simply do not accommodate socially-imposed structures of, for example, private property, political boundaries, electoral cycles and business performance, and our collective social blinders to geological, biological and ecological space-time may well be a central driver of ecological degradation.

Van Koppen and Bush begin with a review of a number of popular concepts employed to define spatial boundaries for the purposes of science or policy. As a means of rectifying the persistent lack of congruence between the spatial boundaries imposed onto the natural world by social forces, and the natural world itself, the authors encourage researchers to focus more squarely on **institutional fit**, describing the need to establish 'a match between the biophysical aspects of ecosystem management in a specific area, the political aspects of territorial control, the socio-economic flows and networks at play, and the socio-cultural meanings of that area as a place.'

Similarly, Lockie and Wong discuss a number of social ascriptions of time that have served to shape environment-society interactions, and social attempts to address disruptions in those interactions, including **the great acceleration**, **time-space compression**, **time-space conquest**,

time-space separation, and **futures**. According to the authors, each of these fails to capture the 'conflict between the temporalities of social and ecological change—between the demands of markets, militaries, politics etc., on the one hand, and the capacity of ecosystem processes to endure, evolve or regenerate, on the other.' Their conceptual review highlights the deleterious outcomes for the environment of the temporalities that tend to govern the social universe (e.g. the linearity and uniformity of industrial clock time, political election periods). Critical evaluation of our socially-prescribed **spatial** and **temporal frames** and their lack of fit with the geological, biological and ecological systems with which we interact, can motivate new innovations in policy, networks, and scholarship. And perhaps on a deeper level, doing so might deepen our comprehension of the in-relations between environment and society.

Upgrading the Social in Studies of Environmental Change

This collection of critical evaluations of contemporary environment-society concepts brings to the fore the persistent tendency in the environmental sciences to evaluate, problematize and prescribe solutions for environmental problems with limited and at times flawed depictions of the social sphere. We draw attention in this section to the need to evaluate concepts on the basis of their accommodation of the complexity embedded in society, to understand processes of both change and inertia, to articulate change-makers of various kinds (innovators, social movements, green entrepreneurs), and also the more basic processes supporting change and resistance.

This conceptual critique also offers a way forward, informing the development of a more nuanced and robust depiction of the actors and processes that define our social systems. By doing so, we can develop a richer understanding of environmental degradation; doing so also empowers us with a realistic understanding of social change. These concepts need to take into account the dialectical relationship between structure and agency, emphasized in social practice theory (Huddart Kennedy and Hauslik, this volume) in particular, which includes the view that human agency is socio-materially embedded (Rau, this volume). The notion of 'common-

ing' (Pellizzoni, this volume) is also compelling, given its attention to process, change and agency in the development of 'commons'.

What Is Social?

What does the 'social' refer to? One would have difficulty identifying another word so commonly used, and so ambiguously defined. No wonder grappling with the social has been an enduring puzzle for the environmental sciences. We are undeniably a species and thus are ourselves nature. There is important conceptual work that needs to be done in the realms of, for example, the role of nonhuman life in democracy theory; the 'agency' of the built environment, and technology; and the integration of energy flows, hydrological cycles, animals, and other components of ecosystems into our analyses.

But incorporating the social requires looking beyond, yet importantly not excluding, our biology. Incorporating the social means conceptualizing people in terms of agency (individual, collective): their consciousness, reflexivity, imagination, discourses, practices and engagement. By addressing the social, we also must take into account inert social structures (culture, class, gender, power, institutions), historical path-dependencies, and the reproduction of structures and processes that cause environmental degradation. If we fail to do this we end up in an over-elastic conception of society (see conceptual trap, Chap. 1). This involves attention to how actors—both lay and elite—are locked into such reproduced patterns, in terms of structurally-induced privilege and vulnerability; material and political inequity; norms and sanctions. Inequities in access to environmental benefits and exposure to environmental degradation, and the sources of those inequities are critical. Key spheres of the social rise to the fore in our conceptualizations of environment-society relations, upon which we elaborate in the following paragraphs.

Economies

The interconnected world is also a world characterized by the dominance of a single economic system—capitalism—that asserts an overriding

force on market forces while diminishing the relevance of their deleterious consequences. Capitalism is the elephant in the room, says Davidson in her chapter, with its driving forces exerting undue influence on environment-society relations, and yet many dialogues on those relations ignore, or even serve to endorse those forces. Theories of Metabolic Rift and Treadmill of Production place capitalism at the centre of analysis; it is also accorded high stature in research on the commons (Pellizzoni, this volume). As noted by Lidskog and Waterton in their chapter: 'Some researchers have … suggested that the term Anthropocene should be replaced with that of Capitalocene because that makes it visible that it is not an abstract humanity but a specific form of social structure centred on capital accumulation that is the source of today's global environmental threats.' The need to challenge the explicit and implicit pro-growth mandates often contained in conceptual discourses is acute.

Governance

Our governance structures must contend with considerable difficulties in establishing the foundations for politics and regulation in a highly complex world, and yet those structures are elemental to societal efforts to address environmental crises. Importantly, the continued authority and legitimacy of the environmental state is in question (Mol), challenged by global flows and networks (Oosterveer), and in particular the elevated influence of corporations in part enabled by such globalization processes. The challenge to establish institutional fit in the spatial (Van Koppen and Bush) and temporal scales (Lockie and Wong) that are invoked in policy mechanisms represents and additional hurdle. As highlighted by Fischer, new innovations in local governance represent a promising field of revisioning of governance arrangements. This is illustrated in alternative living arrangements such as eco-villages, which depend on a revisioning of democracy and deliberation in practice among participants. And yet, as noted by Pellizzoni, inclusion and participation of some always implies exclusion and marginalization of others.

Citizens and Social Movements

Third, we draw attention to the important role of citizens, both as private consumers and as collective agents in social movements and civil society organizations. Can (new) concepts help to break unsustainable norms, and support more long-term, thorough, reflexive learning processes on multiple levels (household, organizations, institutions)? In preceding chapters we find several tools for developing a *socially embedded* view of green consumption practices (Rau, Huddart Kennedy & Hauslik), and collective social practices involved in commoning (Pellizzoni, see also Fischer). Research has also identified a number of constraints to shifts in both personal and political agency, however, illustrated by high numbers of people who embrace the urgent need to take action—but are deeply embedded and locked in to unsustainable structures and practices. Motivating engagement and imagination through changing and reducing consumption practices offer one promising avenue, but these efforts must be tied to existing practices of commuting, leisure, cleaning, shopping and the related norms of time use, cleanliness, and appearance (Huddart Kennedy and Hauslik).

Science/Expertise

Experts, and expert knowledge, have and will continue to play privileged and necessary roles in environmental decision making. Considering the complex nature of many pathways of anthropogenic environmental degradation, societies are dependent upon the expert collection and integration of information. Environmental experts reflexively invoking concepts to explain the interdependencies of the world also create agendas and actively participate in collective efforts to support change. The scientisation of politics, and the politicization of science, however, have generated an antagonistic and hostile environment in which experts function, in ways that compromise the ability to engage in the scientific inquiries that are urgently needed. A crucial component of the confronting of anti-reflexivity is the empowerment of environmental expertise, while also expanding the parame-

ters of what constitutes 'expert knowledge' to encompass other valuable sources of knowledge and experience. As Lidskog and Sundqvist show, structures supporting the development of environmental expertise are the outcomes of long-term processes involving both possessing knowledge and recognition/authorization of it.

A Sociological Imagination of Futures

The transformative impulse of concepts such as sustainable development and environmental justice pose a significant challenge for sociology and cognate social sciences. Monitoring and explaining social and economic change is straightforward enough. So too is mapping social data against changes in ecosystem condition and resource availability. Comprehending social and environmental change, after the fact, places us on relatively secure conceptual and methodological ground. It is worth considering though how we might contribute to positive social and ecological transformation before the fact—an ambition that raises its own ethical and epistemological questions. It is not up to sociologists (or environmental scientists), after all, to tell people what they should value or how they should aspire to live. Our ability to forecast the future, moreover, is inherently complicated by the capacity of people to respond to projections, scenarios etcetera by changing their behaviour (the double hermeneutic again) and thus undermining the assumptions on which forecasts are based.

So how then are we to apprehend a more just and sustainable future (or whatever concept the reader embraces)? The answer to this question, we believe, lies in the very reflexivity that complicates attempts to forecast social-ecological change. In fact, complicating our understanding of how social-ecological relationships might change through space and time is precisely the point. Reflexivity among scientists and scholars is a minimum requirement for advancing conceptual and empirical understanding of the future. Reflexivity among broader communities of interest (including policy-makers, civil society and so on) is a minimum requirement for ensuring that future is a desirable one—for ensuring that the lessons of historic degradation of the social and ecological

spheres are learned and that enduring threats to social and ecological wellbeing are abated. For the environmental (social) sciences, importantly, these two broad dimensions of reflexivity are inseparable—our own conceptions of the future seeking to reflect and inform the processes of learning, policy deliberation, alliance building, conflict, and so on, implicated in social reflexivity.

Reflexivity is not a silver bullet. People and institutions routinely respond to social and environmental degradation in ways that deepen these problems. Many have a stake in the status quo, even supporting denialist movements, and many more struggle to imagine or to implement alternatives. Yet, as we have argued throughout this chapter, concepts do matter, as do the explanations and action-orientations they embody. We cannot simply think a new world into being but we can ensure that the assumptions and limitations of conceptual models are interrogated and that opportunities for reflexive engagement with these concepts are improved. This is as true of the conceptual models developed outside the social sciences (see Lockie and Wong) as it is of those from within. As Lidskog, Mol and Oosterveer (2015) argue, environmental sociology (and science, in general) ought to be both problem- and solution-oriented—critical of the relations that produce social and environmental degradation and constructive in the search for meaningful solutions. We have a particular responsibility, hence, in the environmental social sciences to ensure that all conceptualizations of social-environmental change account for inequality and allow for confrontation with power. Indeed, the very idea of the sociological imagination (see Chap. 1) presumes a capacity to see both how social relations produce history and how they could be different.

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Afterword: Irony and Contrarian Imaginations

Matthias Gross

The sociological imagination has always fostered views on the dialectics of things, on radical changes, or unexpected turns in social processes. As Magnus Boström and Debra Davidson have also shown in the introduction to this book, in the tradition of the classical notion by C. Wright Mills (1959), the sociological imagination refers to a view of society that invites us to think counterintuitively and look at the social world from a different angle. Methodologically, this includes the juxtaposition of opposites and of complementary notions as an essential characteristic of (critical) sociology in general. In this tradition Alejandro Portes (2000) even saw the uniqueness of sociology, as it differentiated itself from other disciplines. Focusing on unrecognized, unintended, and emergent consequences of goal-oriented activity, Portes pointed out the "contrarian vocation" of this discipline, which "has been the prime source of sociological insights and intellectual excitement" (Portes 2000: 6). This

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uniqueness of sociology also involves emphasizing the paradoxes of social life, of indeterminacy, of taking opposite positions (independent of one's private opinion) and "bashing myths," as Norbert Elias (1978) called it. Thus understood, environmental sociology—with its focus on conceptualizing ecological conflicts, uncertainties and the many forms of unintended side-effects that result from interactions with the natural world—seemed to be a perfect fit with this tradition in general sociology.

However, as Stewart Lockie (2015) has nicely argued, most summaries of themes in environmental sociology still focus on debates from the 1980s and 90s, such as constructivism versus materialism or ecological modernization versus ecological realism, as well as superficially broad geographical attributions such as European versus North American sociology. In addition, recent developments within the above dichotomies sometimes appear to be moving towards an overly narrow mindset in relation to research foci and what is politically feasible or "mainstream." Examples of this include accepting dominant concepts such as the Sustainable Development Goals (SDGs) as a given, or simply repeating statements from one's favorite environmental NGO. This does not promote the potential of environmental sociology as a critical enterprise that is able to critically reflect on commonly embraced concepts and contribute towards the development of a broader field of environmental science, which is necessary in light of today's wide range of environmental problems.

In the following I will playfully reflect on some tendencies that I consider to be "unimaginative" and, by so doing, argue for a more "ironic perspective" in twenty first century environmental thinking. This includes taking a slightly "irritated" view of contemporary environmental debates in order to irritate the reader and clarify the limitations of some of environmental sociology's (among many other disciplines in the environmental sciences) preset normative assumptions. After all, in the 1970s the environmental movement and the resulting academic reaction provided an alternative to mainstream thinking about progress and economic growth. Today, in many countries the environmental sciences are well established and belong to the mainstream of academic disciplines themselves. Over time, however, a lot of "green thinking" has lost its edge. In a way, environmental sociology (and frequently other environmental sciences as well) reminds me of the German Green Party, which evolved from the new social movements of the 1960s and 70s to become a

mainstay of the political scene. In the world of the twenty first century, however, the Green Party often seems out of place, almost romantic in their interpretations of contemporary politics and perhaps even moving towards irrelevance, given that most other parties have now taken up environmental issues, albeit without the excessively moralizing and even autocratic undertones harbored by the Greens. Hence, some observers such as Manfred Güllner (2012) have long argued that the Green Party is kept alive by a small segment of the voting public and will cease to exist once those voters pass away. Younger voters are not interested in explicitly green topics, given that other parties tackle environmental problems in a much a less moralizing manner.

In a similar way, the overly moralistic and often ideological one-sidedness of a lot of environmental thinking—environmental sociology included—has worn thin, since it often excludes alternative ways of viewing environmental challenges. Very often it is possible to guess the results of an article before one has even read it. Reflecting on my own discipline, environmental sociology increasingly reminds me of what Ludwik Fleck (1979) once referred to as "the tenacity of systems of opinion": when a certain style of thought locks a group of researchers into a particular thought collective and there exists a well-established "harmony of illusions." In order to develop new insights, however, old ones—perhaps especially the harmonious ones—may need to be overthrown. This overthrowing of old insights is difficult, because over the last 40 years environmental sociologists have developed specific ways of theorizing and arguing, which means there may be a certain blindness to alternative methods of conceptualization. Think, for instance, about the mostly unquestioned centrality of "risk" oriented research in environmental social science or the unquestioned consensus, however ill-defined, about who the "bad guys" are. The result is either some conspiracy-like explanation that points to a set of circumstances caused by a secret plot by a group or covert organization with lots of power, or overly abstract notions of capitalism, neoliberalism, or big industry as drivers of doom. This often happens without any conceptualization of what exactly is meant by the terms attributed to the "bad side" (Kelly 2013). The "good side" implicit in this equation is more or less always NGOs, grass roots movements, environmental groups of all sorts and, if nothing else, the environmental challenges are framed in terms of "us versus them." These views

seem to have become part of the "tenacity of systems of opinion" (Fleck 1979: 27).

Given unavoidable uncertainties and ignorance in science and engineering (Firestein 2012), this resistance towards thinking outside the box is not really surprising. After all, this tenacity of opinion may also be a way of dealing with uncertainties and ignorance, since having stable opinions reduces uncertainty by pointing to just one correct course of action. However, sociologists and other environmental scholars should take advantage of these uncertainties in a different way, openly acknowledge knowledge gaps (their own and others') and continuously ask "what if my assumption is wrong?" For this to happen, we need to become aware of these assumptions in the first place. This is not easy, since, as Fleck puts it: "Once a structurally complete and closed system of opinions consisting of many details and relations has been formed, it offers enduring resistance to anything that contradicts it" (Fleck 1979: 27). In short, it becomes a mental habit. So how can we break this habit? Perhaps irony can help. Irony, the use of language that signifies the opposite of what is actually meant, not only perfectly fits the contrarian vocation of sociology and the sociological imagination in general, it also allows us to frame the dialectics of things, unintended side-effects, sudden ruptures, radical systemic changes, epochal breaks and the unexpected rise of novel system structures. Furthermore, an ironic perspective, as Louis Schneider puts it, fosters a "wry smile just because one witnesses the bafflement or mockery of the fitness of things, of their supposed-to-be character" (2012: 324). If someone has a wry smile or wry expression, it indicates that they find a bad or difficult situation slightly amusing or ironic. Environmental sociology and perhaps the environmental sciences more broadly might be perfectly suited to embracing irony as a method for gaining counterintuitive insights. After all, humor can act as a coping mechanism (Parkhill et al. 2011), but also as a means to illustrate unsustainable trends (Lyytimäki 2015). Humor could be used as a tool to highlight discrepancies between preset conceptual assumptions and reality. For instance, environmental sociology attempted to "bring nature back in" and at least in some streams of the field allowed "non-social actors" to disrupt linear processes and regularities. Of course, when unexpected things happen they may be interpreted as wrong. Instead of taking a

normative stance, an ironic perspective in sociology may help scholars to stay detached or more neutral towards their objects of observation, and, by so doing, provide an opportunity to better understand the relationship between nature and culture. An ironic perspective might also aid the development of counterintuitive hypotheses or allow for new styles of thought and opinions. Consider the following example: viewing denial as regular.

Recent debates on post-truth politics or the notion of "alternative facts" can be seen as an indicator of efforts to harness and deploy ignorance as important and profitable strategies within economic and political institutions. A number of scholars, some working in the tradition of Georg Simmel's (1906) reflections on secrets and secret societies, have explored the relationship between secrecy and the unknown. Oreskes' and Conway's (2011) work on the tobacco industry and global warming, for instance, examines the ways in which different industry groups and "think tanks" have purposefully fostered doubt about the effects of certain industries' products (see also Freudenburg and Muselli 2013). Although writings such as these or the many studies on climate denialism (e.g. Jacques et al. 2008, Norgaard 2011) can alert us to the cultivation of doubt for commercial gain, they not only amplify a preset stance against certain forms of knowledge or nonknowledge, but also often ignore alternative ways of viewing the world by rejecting skeptical views as politically unacceptable or incorrect. Worse still, calling people who deny climate change "climate skeptics" is an abuse of the term skepticism. After all, skepticism can be rendered a crucial element in the organization of scientific endeavor, a fact that should be well known thanks to Robert Merton's collection of scientific norms, in which skepticism is deemed central to scientific investigation since it helps "to invalidate particular dogmas" (Merton 1973: 278). Jonathan Aldred, for instance, refers to himself as a "skeptical economist" in order to challenge the limitations of traditional economics (Aldred 2009). In environmental studies, for some reason, skepticism is often rendered a form of "anti-science." However, if one side of an argument is treated as simply true or morally superior, then it is impossible to take a skeptical view or even an ironic view.

Imaginative environmental sociology should, in my view, go one step further and show that denial, risk, ignorance, secrets, etc. need to be understood and theorized as a regular part of decision-making in general, of social interactions, of everyday communication, of speech acts and of actions in general (including writing chapters for academic books). I do

not think denialism and spreading doubt need to be viewed as uniquely useful or profitable for the powerful or any group in society. Depending on the perspective taken, the deployment of ignorance can be an emancipatory act, bypassing oppressive or demeaning demands for knowledge disclosure, such as the expectation that one should disclose one's sexual orientation. The view that ignorance, risk and denial are "normal" rather than deviant is based on the insight that human decision-making is always located on the boundary between knowledge and ignorance. In other words, human existence per se is a matter of constantly negotiating what is known and what is not known. Thus, following Simmel's classic argument, in addition to knowledge, it is important to understand the complex "interweavings" of what is known and what is not known if we wish to grasp the quality, the depth, and the nuances of human interactions in general. The paranoid visions espoused by political think tanks—which are on the verge of destroying Western civilization—may be good for debates on social media or at the pub, but they do not constitute sociological discourse that inspires creativity and imaginative thinking. Or, to use Fleck's metaphor again, they will not enable us break free from our well-established styles of thought, but instead help us to maintain our "harmony of illusions."

Thus understood, an ironic perspective could be a cure for rigorous thinkers in sociology who have gone too far with their rigorousness. But how can we make an ironic perspective part of a new environmental sociological imagination? Perhaps by looking at recent debates in certain fields and then turning things on their head to foster the sociological imagination. For instance:

- If someone says there is denial, we may actually have to look for well-founded skepticism (i.e. think beyond climate change and reapply the old Mertonian norm of science as organized skepticism).
- If someone says "adaptation," it may mean the path of least resistance, i.e. the comfort zone.
- If resilience is the proclaimed normative standard or goal, it may also be viewed as the problem (e.g. conservatism).
- If someone says "sharing economies," it may simply mean capitalism's latest dirty trick.

- If one says "capitalism," it may mean market, goods and services, imperialism, consumption or almost anything else.
- If someone says "consumption," social practices may be the category we ought to look at.
- If someone says "practice," it may just be a lazy way of analyzing different aspects by lumping them together into "bundles of practices."
- If someone says "complexity," it may be an excuse for not seeing the trees for the forest.
- If someone calls for "precaution," (pro)action may be needed.
- If someone attacks "neoliberalism," it may be yet another straw man.
- If someone says "critical" (as I did several times in this essay), it may mean they like to complain (whining sociology disguised as critical sociology).
- If someone says pragmatic, it may mean lazy, incremental, or "anything goes."
- … and, of course, for each of these examples, the opposite is also true.

If an ironic perspective can be seen as the New Environmental Sociological Imagination, we only need to figure out how to inspire that wry smile that results from witnessing the mockery of supposedly natural social phenomena. Perhaps this book can help, after all. If you haven't smiled yet, perhaps you should immediately start rereading the previous chapters and embrace your urge to chuckle.

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[1] Note: Page numbers followed by 'n' refer to notes.

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