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Kropp | Sonnberger

Environmental Sociology

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Foreword

As we completed our work on the English version of this introduction to environmental sociology in October 2024, media reports were filled with news of escalating disasters. In Spain, torrential rains had just caused flash floods, resulting in more than 200 deaths, Australia saw its hottest September in record, with temperatures 3°C above the long-term average, causing health problems for both human and non-human beings. Globally, summer 2024 was the Earth's hottest on record, and in August 2024, the average land temperature in Europe was 1.57°C above the 1991-2020 average, according to the Copernicus Climate Change Service. In 2023, nature's carbon sink failed for the first time, with trees, plants and soil showing almost no net absorption of carbon dioxide emissions due to enormous forest fires and rising sea temperatures. In Canada alone, 6,623 wildland fires had burned more than 15 million hectares of managed forests. "We're seeing cracks in the resilience of the Earth's systems … the oceans showing signs of instability"[1] said Johan Rockström, director of the Potsdam Institute for Climate Impact Research, about these phenomena, which are not yet factored into climate models. Extreme weather events have already become part of our normality, and local governments around the world are urgently developing climate adaptation strategies to keep cities habitable. In each of these regions, institutions struggle to manage climate impacts, highlighting a troubling lack of preparedness and action capacity. At the same time, continuous updates of the planetary boundaries framework in Earth sciences' find that six of the nine boundaries are transgressed, "suggesting that Earth is now well outside of the safe operating space for humanity" (Richardson et al. 2023: 1). Now more than ever, future generations must confront the urgent task of reimagining lifestyles and economic practices, working towards their sustainable transformation. We believe that environmental sociology has a great deal to offer in this endeavor. This textbook is particularly relevant for students in social sciences—sociology, political and communication sciences, human geography, psychology—where an understanding of environmental sociology has become essential for a well-rounded education that meets today's needs.

With this in mind, we hope this English translation of our introduction to environmental sociology reaches a broad audience. Our goal is to provide students and other interested readers with a comprehensive overview of key theories and research in this essential field. The book offers a theoretical and thematic guide to the major issues and approaches in environmental sociology. While our coverage, based in Germany's long tradition in environmental sociology, is necessarily selective, we aim to present foundational theories alongside both classical and current research areas. To assist in learning, each chapter includes a brief introductory summary and a closing overview of the chapter's key points. Each chapter also provides a list of recommended readings with brief annotations. Designed to be suitable for use in both seminars and lectures, as well as for independent study, we hope the book serves as a valuable resource.

1 Source: The Guardian, https://www.theguardian.com/environment/2024/oct/14/nature-carbon-sink-collapse-global-heating-models-emissions-targets-evidence-aoe, accessed on 31.10.2024.

We extend our gratitude to our colleagues at the Department of Technology, Risk and Environment at the University of Stuttgart and the Center for Interdisciplinary Risk and Innovation Research at the University of Stuttgart (ZIRIUS) for their insightful discussions and constructive feedback. We are grateful to work in such an inspiring environment! We thank the student assistants Hanna Sophie Mast, Lukas Günsch, Lena Ebersbach and Amelie Dresel for their invaluable help with proofreading and formatting both the German and English versions of the book. Our thanks also go to Alexander Hutzel, Eva Lang and Fabiola Valeri of Nomos Publishing for their assistance with the publication.

Munich/Stuttgart, October 2024

Cited literature:

Richardson, K., W. Steffen, W. Lucht, J. Bendtsen, S.E. Cornell, J.F. Donges et al., 2023: Earth beyond six of nine planetary boundaries. Science advances, 9 (37): eadh2458.

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Chapter 1: Introduction – The social recognition of environmental problems

Overview

In this chapter, you will learn about the issues and questions that environmental sociology seeks to tackle, as well as the difficulties associated with them. You will become familiar with realism and social constructivism, the two basic epistemological positions from which fundamentally different approaches to environmental sociology are derived and which are therefore hotly debated. Of course, you will also gain an impression of the importance of climate change, global environmental change and their consequences for society in sociology.

Every single day, the social subsystems of politics, the economy, science and civil society are confronted with the issues and consequences of global environmental change and climate change. Environmental science has long shown that the ways in which we manage our economies and live today are not sustainable. The damage, risks, and unintended side effects that our way of life causes, for example, in the form of carbon dioxide emissions, soil degradation, species extinction, and resource depletion, make fundamental change a necessity (Richardson et al. 2023). Despite this, all subsystems are dominated by a no longer carefree yet strangely unwavering adherence to unsustainable goals, routines, and structures (Blühdorn 2022). The Canadian environmental sociologist *Raymond Murphy* (2015) sees the causes of this societal inability to find adequate responses to the global environmental catastrophe in the reaction patterns with which societies ignore transformation necessities. Since their economic and supply concepts are dependent on fossil infrastructures, they construct path-dependent "normalities" either by denying the problems or through technocratic optimism about solutions ("*wishful thinking*"). Thus, the magnitude and complexity of the necessary change seem to be mirrored in the behavioural rigidity that opposes it. This makes it all the more urgent to understand society-nature relations, and the conditions that enable them to function and change. These are precisely the kinds of questions environmental sociology seeks to investigate. This textbook aims to introduce this field of research, familiarise readers with the most important theories, and enable them to understand the social aspects of the geological era known as the Anthropocene, the (white) man-made modern era (Crutzen 2002).

This introductory chapter has three goals: We will define the subject matter of environmental sociology, outline the emergence of the field of research related to it, and look at the major challenges on which environmental sociology must take a position. These three goals cannot be pursued separately, because the determination of the subject matter, the approach, and the tasks are closely interrelated: they are mutually dependent on one another. The need to deal with mutual influences and effects (*interactions and interdependencies*) can be considered constitutive for environmental sociology as well as the sociology of technology. This is demonstrated in the following discussion about the subject matter and development of environmental sociology. We continue paying attention to categorical interactions throughout the rest of the book in order to understand the

interdependencies between "environment" and "society" and to demonstrate their significance in environmental sociology.

1. Environment and nature as objects of scientific observation

The way humans gain knowledge about "the environment" (*epistemology*), and the intensity with which they shape and change the so-called natural environments (*physics, biology*), are interdependent. Epistemologically, contemporary knowledge about the natural environment and the opportunities and risks associated with it comes primarily from systematic observations, experiments and simulations that are mostly scientific and technical. However, these observations, for example weather records or observations about plant growth and possibilities for increasing yields, are not 1:1 representations "of the world out there". Instead, they are influenced by societal interests and beliefs as well as by the instruments of observation (→ chap. 3 on society-nature relations, section 3 on relational theories of environmental sociology). For example, early weather records (which began in Germany in 1881) were mainly focused on locally significant major weather events and their consequences (storms, floods, dry seasons); in contrast, in contemporary meteorology, global contexts and long-term changes occupy a privileged position. Which weather data are generated depends on the interests that the data are intended to serve, such as interests in disaster management or productive agriculture. The type of data generated changes as new interests emerge and new technical instruments for data collection are developed, such as measuring stations and their locations. Therefore, the weather record only provides an imperfect and selective image of the terrestrial weather, according to whichever features are selected as relevant and the options available for observing them.

Epistemologically, two basic positions are used to evaluate environmental observations in environmental sociology (Rosa 1998; Dunlap 2010): realism and social constructivism. These will only be roughly sketched here. *Realists* assume that the basic structures of reality can in principle be reliably represented in (data-based) experience and can at least be described in a scientifically valid way: according to this position, meteorology provides a reliable image of the weather and climate. That is, realists assume that a biophysical world exists that is independent of human interpretation and that this world can (at least partially) be objectively grasped as such by humans. *Social constructivists,* on the other hand, emphasise that nature must always first be recognised linguistically, culturally and scientifically, and that all knowledge is therefore situated in cultural, technical, and social practices. They assume that the described realities (*ontologies*) also always carry within them the (historically and culturally diverse) perspectives from which their description arose. From a social constructivist perspective, the images that people make of nature and the environment to construct their reality are models embedded in socio-cultural presuppositions and rooted not least in the technologies that people have created in order to be able to observe, measure, and interpret their environment. What the world beyond these social descriptions is "really" like remains in principle inaccessible. From a social constructivist point of view, mete-

orology thus provides a description of weather and climate that also expresses the respective social interests, hopes and concerns as well as the instrumental possibilities of weather observation. Consequently, knowledge about nature and society depends on the underlying expectations, perceptual categories, and instruments of investigation. However social constructivists do not assume that knowledge about nature and society is intrinsically arbitrary or fundamentally "wrong", but rather that it is selective and embedded in the social and technical conditions of its production. Radical constructivism (Glasersfeld 1997) represents another perspective. Constructivists make a distinction between external reality and the human construction of reality, because every image of the world ultimately arises in the human sensory apparatus and is a construction of the brain, which processes the sensory impulses according to its own laws (*autopoietically*). Accordingly, radical constructivists assume that no "reality" exists independently of human interpretation; instead, the external counterpart always appears as a biological-mental construct. From the perspective of radical constructivism, truth or objectivity is not a question of conformity between external reality and internal reality, but of "viability", i.e., the usability of the constructed images for further action and decision-making.

Social constructivism or "moderate constructivism" can be seen as a compromise in the realism-constructivism debate, in which the emergence and interpretation of knowledge is conceived as socio-technically mediated and socially constructed. Murphy describes this position as "constructionist realism" as follows: "Humans socially construct their conceptions and practices (including those concerning nature and risk), as well as technologies, according to their culture and power. They are not, however, pure discursive spirits in a material vacuum, but instead embodied beings embedded in a biophysical world" (Murphy 2004: 252). This position provides a fruitful epistemological basis for environmental sociology and interdisciplinary cooperation with the natural and technical sciences, without pushing the critical potential and genuine epistemological interests of sociology too far into the background. Accordingly, "moderate constructivism" is the basic epistemological position on which this book is essentially based (exception: relational approaches in chap. 3 on society-nature relations).

2. Environment and nature as objects of social appropriation

From a sociological perspective, the descriptions of climate and nature—and thus also our understanding of them—change because our methods and interests change. At the same time, climate and nature are themselves dynamic and our understanding of the way they work is used to shape them according to human needs and expectations, or to reshape and "appropriate" them. Talk of the social, or capitalist, "appropriation" of nature comes from economic theory and, since the analysis of capitalist societies in political economy, has been accompanied by a view that the alienation of labour is also an alienation from nature, whereby nature is reduced to a (usually privatised) means for the purposes of human existence (Moore 2015). Thus, nature is not seen as having any intrinsic value; instead, "unprocessed nature" as an extra-societal presence only acquires value

when it contributes to private property formation or to the creation of social value, for example, as fertile soil for the farmer or as a generative principle in biotechnology. Here and in the following, we generally understand the social appropriation of nature to mean the fact that, at the latest since the emergence of industrial societies, nature exists only as "socialised nature", because its manifestation reflects the various social modes of appropriation of earlier societies. These can be economic forms of nature appropriation, but they also include the forms of appropriation seen in global tourism or nature conservation, which likewise serve human purposes.

The social appropriation of nature changes our perception of nature, because nature and the climate then do not exist as pre-human primary nature, but as socially reshaped (appropriated) and globally "warmed" secondary nature. To stay with this example: Weather and plant growth change within the context of climatic fluctuations and through interactions with each other. In addition, humans influence weather and plant growth intentionally, based on their knowledge and interests, and also unintentionally. For example, cloud seeder aeroplanes alter the amount, type and location of precipitation by "seeding" clouds with mixtures of silver iodide and acetone to protect agriculture. Genetically modified crops are introduced to gain higher yields or better resilience to climate change. At the same time, they sometimes result in unintended changes, such as outcrossing in neighbouring plants. Both measures thus change the effects and the perception of climate and nature.

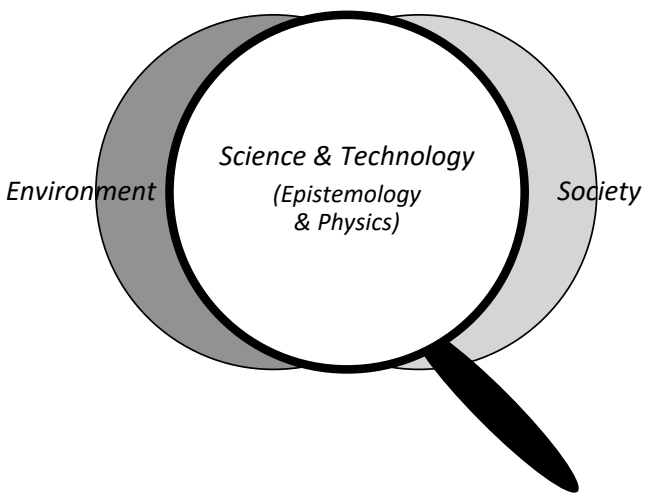

Figure 1: Environment and society understood through a scientific/technical lens; source: own illustration

Environment, or what we call and perceive as "environment", and society, likewise a social construct, can therefore only be studied *sociologically* by taking into account the epistemological contexts in which they are described and the

socio-material contexts in which they change. In addition to specialised global change sciences, biology (the science of living beings) and physics (the science of the fundamental phenomena of nature, its properties and laws) provide analyses of the inner workings and effects of the environment and also take into account interactions between matter and energy in space and time. Textbooks on environmental sociology must always consider the scientific/technical mediation of society-nature relations, which is represented in Figure 1 as a magnifying glass of knowledge and influence. This textbook was therefore designed so that all chapters take into consideration the scientific/technical levels of mediation and their epistemological and bio-physical conditions.

3. Environment and nature as subjects of environmental sociology

This brings us to the heart of the current difficulties: All societies are urgently seeking answers to the manifold threats posed by global warming, ocean acidification, species extinction, and other unintended side effects of technological progress. If, for example, our relationship with nature is to be deliberately redesigned through transformations in the energy, agricultural, and transport industries, then environmental sociology should direct its attention to both a) the societal perception and evaluation of the underlying problems, goals, and approaches for solving problems, as well as b) the organisation of the respective relationships with nature and their spatially and temporally given conditions (→ chap. 3 on society-nature relations). This can be done, for example, in the context of sociological analyses of scientific climate descriptions, individual environmental attitudes, collective consumption patterns, political decision-making processes, or environmental laws. The studies then concentrate on the societal handling of problematised natural conditions ("social nature"); the biophysical interactions between nature and society remain excluded.

However, there is a dispute within the discipline about what the contribution of sociology should be: For some, it should be limited to the sociological study of perceptual processes and the conditions of social action and inaction. Others argue that sociologists should use their knowledge of social change to investigate ongoing and necessary processes of socio-ecological transformation and to intervene regarding the shaping of those processes. In the second perspective, it is not possible to develop this field of investigation—which now encompasses environmental problems, the perception of those problems and approaches for overcoming them—without simultaneously engaging with scientific and technical approaches. Therefore, inter- and transdisciplinary[2] cooperation with the technical and natural sciences and with relevant societal actors outside science is unavoidable (→ chap. 10 on transdisciplinarity). Ultimately, any societal engagement with the internal and external nature of people, i.e., with their bodies and the physical-material environments of their actions, is shaped by technologies and

2 The term transdisciplinarity describes a research approach in which several scientific disciplines work together and incorporate input from non-academic actors (e.g., from public administration, civil society, or business) to develop knowledge about real-world problems and their possible solutions (Brandt et al. 2013; Jahn et al. 2012).

their context-specific use. Since the Stone Age, people living in various forms of cultural organisation have used a wide variety of technologies not only to depict and reflect on natural processes, but also to use and modify them to their advantage. The nature of these technologies shapes the sociological understanding of the respective societies so fundamentally that they are described, for example, as agrarian or industrial societies.

Science and technology and the organised forms in which they are used thus fundamentally mediate society-nature relations. Whenever there is talk of species extinction and climate change or of energy and mobility transitions, sociologists are always dealing with a field of investigation in which other experts (for example from the fields of climate research, engineering sciences, and political offices) have a superordinate claim to knowledge. That is, their expert descriptions of the problems and possible solutions are seen as higher ranking or more valuable. Given this situation, sociology can either focus its research interests on the emergence, meaning, and impact of these descriptions, such as the descriptions of climate change, or take these descriptions as a starting point for their investigations into the consequences within society, such as climate discourses, policies, and risks, or take them up as a point of reference for the exploration of society's possible modes of reaction to individual climate protection measures or the "Great Transformation" (WBGU 2011; Gross & Mautz 2015). Thus, sociologists sometimes investigate the scientific diagnoses of environmental change, which are usually controversial, sometimes they look at the societal consequences of those diagnoses, and sometimes they explore the spaces available in society for reacting to the diagnoses.

Sociology, like the historical sciences, finds it difficult to realistically regard the diagnoses presented by other disciplines (e.g., climate knowledge) as an unquestioned starting point. After all, one of sociology's basic insights is that perceptions, problem discourses, and forms of reaction are shaped by societal influences such as cultural values and political interests—and that this applies equally to the world of science (Mannheim 2013 [1929]; Luhmann 1993). If sociology takes a social constructivist approach to the diagnoses, it can show the extent to which climate knowledge is part of the social construction of reality (Berger & Luckmann 1991 [1966]), but from this perspective it is not possible to formulate legitimate proposals for action, nor does it succeed in grasping the context of the problems "behind" their social thematisation. Instead, society-nature relations and environmental problems get lost in the social communication about them. In the realist approach, environmental sociology thus appears as a "society-blind" auxiliary discipline that is limited to studying the social acceptance for measures taken in response to authoritative diagnoses, without being able to consider the social embeddedness of these diagnoses and measures. Thus, the power relations, disparate interests, and typical perceptual distortions in the scientific and political handling of environmental problems and the development of measures, which sociologists feel responsible for exposing, remain hidden. Conversely, in the constructivist approach, environmental sociology appears as a "reality-blind" single discipline that produces analyses of the various expert and lay assessments of

nature, technology and environmental problems, but which is not able to join other disciplines in the search for solutions to environmental problems. Thus, crises in nature-society relations, including those that potentially threaten societal and human survival, remain hidden from the very science designed to investigate societies.

4. Theoretical perspectives of environmental sociology

How, then, can and should environmental change and possible social modes of reaction be researched in sociology, if either the respective diagnosis must be regarded as a social construct, which differs nationally, historically and disciplinarily from the interpretations under other conditions (sociology of knowledge), or if, conversely, we ignore the social conditions in which the problem is interpreted and possible solutions are formulated (positivist)? From the point of view of "moderate constructivism", for this question it is important to examine the categories, patterns and structures through which society perceives the natural environment and how it interacts with it. For this investigation, environmental sociology provides answers within the framework of two different paradigms: In the first, more social constructivist paradigm, the focus is on society's perception of nature external to society, and also on the reconstruction of its meaning within society (→ chap. 2 on the social construction of nature). The focus is on the role that nature discourses and perceptions play in society, and their effect on ideas about how society can respond to the ecological crisis.

In contrast, the second approach focuses more strongly on the interactions, interdependencies, and intermingling between nature and society (→ section 3 on nature-society relations). This perspective explicitly addresses the problem that not only the analysis of and talk about environmental problems takes place *in* society and is shaped by its structures, but that society, beyond discourse and representation, is also physically and materially involved in the production and reproduction of nature, the environment, and environmental problems to an appreciable extent. There is no longer any primary nature on Earth in the sense that it exists independently of human actions and activity. Even the large nature conservation areas depend on human-made laws, are affected by emissions, and are analysed and mapped by scientists. The American historian of science Donna Haraway views the current state of terrestrial nature (among other things) as a plantation in which anthropogenic processes interacting and intra-acting with other processes and species have produced planetary effects (Haraway 2016; → sections on Donna Haraway in chap. 3 on nature-society relations).

The term Anthropocene thus refers to the fact that humans have become the main influencing factor in the history of nature and the Earth: There are many indications that humans have irrevocably changed the planet and its climate. In the third chapter, we therefore devote ourselves in detail to such theoretical approaches, which are becoming more and more prevalent in the sociological consideration of environmental problems. Their focus goes beyond realism and social constructivism and lies on nature and technology as historical products of specific

interactions and assemblages. Figure 2 shows a diachronic perspective on the left, i.e., the temporal development of the progressive penetration and entanglement of environments and societies, while on the right a synchronic perspective is shown, i.e., a snapshot of the present moment, with the diversity of different natural relationships that exist concurrently.

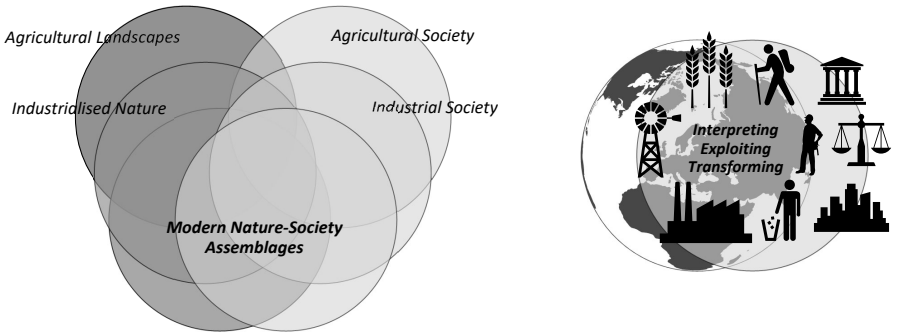

Figure 2: Societies and their environments, diachronic development and synchronic diversity; source: own illustration

Environmental sociology determines how different and unequal social relationships with nature are, how social groups—institutionalised at different levels—interact with natural and technical entities and thereby produce increasingly unstable "assemblages", i.e., hybrid networks of heterogeneous, human and non-human elements, such as cities with their institutions, actors, infrastructures, resource consumption, etc. (Latour 2005, → sections on Bruno Latour in chap. 3 on society-nature relations).

5. The development of environmental sociology

Entirely in the sense of Max Weber and Alfred Schütz, environmental sociology firstly includes any individually and/or collectively meaningful thinking and acting that is directed towards the biological, ecological, energetic, material and technical goals of social action, which are colloquially referred to as body, nature, environment and technology. The focus is thus on all matters of concern that arise less through the immediate research object ("environment"), but through references to social lifeworlds that are always already pre-interpreted by thinking and acting people (Schütz & Luckmann 1980). In addition to meaningful thinking and acting oriented towards the phenomena of body, nature, environment and technology, environmental sociology also examines the structures and problem areas that arise as direct and indirect (often unintended) side-effects of this thinking and acting, or which arise as their unconscious crystallisation at the meta-level, for example, the risks of industrial production processes (→ chap. 5 on risk) or the routines and infrastructures of a highly mobile society (→ chap. 9 on infrastructures) whose future viability is in question. The focus is thus on the interactions of societies or different social groups with their natural and technical

environments, their progressive interpenetration and the resulting sustainability problems. These sustainability challenges in particular and the questioning of the continued validity of leading convictions in science, politics and society have led to the fact that a large part of environmental sociology critically examines social structures and technically and economically formulated necessities. In this respect, environmental sociology is also a critical social science with an interest in transformation processes (→ chap. 8 on innovations and transformation processes).

Compared to other sociological fields of work, environmental sociology has a relatively short history. It began in the United States and Western Europe as a reaction to the early environmental movement and as an approach for examining the undesirable consequences of growth and progress. The first authors, who are exclusively white men, were primarily concerned with applying a sociological perspective to address environmental problems that were only just starting to garner public attention. At the core of the discipline, this request was met with rejection: it seemed to contradict Durkheim's programmatic rule of sociological method (explaining social facts by social facts) and instead open the door to biological and technical reductionisms, thus relegating to the background the forces of social development judged to be more significant, such as differentiation and rationalisation (Kropp 2002: 29– 47). If we look at the emergence of environmental sociology in the turbulent 1970s, we can clearly see the extent to which its subject matter challenges traditional sociological thinking. After 20 tough years of struggle, William Catton and Riley Dunlap, two American pioneers of environmental sociology, laconically summarise the discipline's problematic tradition: "The Durkheimian legacy suggested that the physical environment should be ignored, while the Weberian legacy suggested that it could be ignored, for it was deemed unimportant in social life." (Dunlap & Catton 1994: 14).

Sociology was founded at the time of industrialisation and developed as a theory of modern industrial society, hence it also unwittingly adopted an industrialised worldview. In it, "emancipation from nature"—understood as overcoming natural hazards and natural scarcities—plays a central role, especially in relation to expectations of social progress.

An implicit concept of nature, however, entered into all sociological publications, whereby nature usually forms, at least semantically, the opposite or antithesis to society, culture, and technology, so that conceptual reflection on nature is at the same time a reflection on society (Soper 1995). For Karl Marx, who paid fundamental attention to the metabolism between humanity and nature as a productive force, the social "realm of freedom actually begins only where labour which is determined by necessity and mundane considerations ceases" (Marx 1998 [1894]: 807) – that is, when the constraints imposed by "first nature" (the laws of nature) and bourgeois society as "second nature" are overcome. Emile Durkheim, in contrast, reconstructed the "social facts and things" with reference to their significance in the formation of social order. He was interested in natural and technical phenomena exclusively in relation to their function for social coexistence. Max Horkheimer and Theodor Adorno were among the first to address the unseen repercussions of humans' increasing domination of nature. In 1947,

in their "Dialectic of Enlightenment" (Horkheimer & Adorno 2002 [1947]), they criticise the enforcement of one-sided instrumental reason, arguing that such an approach turns the mastery of nature into the starting point for the domination of internal and external nature. As a consequence, subjects become incapable of recognising the strangeness and diversity of nature; rather, instrumental reason leads to a positivism of the factual and ultimately turns against civilisation itself.

Ulrich Beck takes up this reflexivity, with which technological progress, rationalisation, and differentiation as linear ideals of modern societies turn into a politically, economically, and ecologically threatened "risk society" (→ chap. 5 on risk). With his ground-breaking book "Risk society. Towards a new modernity" (1992, in German: 1986), he documented a fundamental shift in perspective in sociology: the market economy and industrial society had long ceased to be regarded as perennial success stories and were instead viewed as institutionally overburdened in dealing with self-produced risks and side effects. Beck's analysis appeared shortly after the reactor accident in Chernobyl and in the very same year as Niklas Luhmann's "Ecological Communication" (1989, in German: 1986) and, towards the end of the 20th century, influenced a generation of sociologists who were increasingly concerned with the environment, technology and risk in society.

Leading social theorists, such as Anthony Giddens (2009), Zygmunt Bauman (2011), Bruno Latour (1993; 2017), and John Urry (2011), also discussed environmental issues from a sociological perspective and consider how ecological risks and societal responses should be addressed in the discipline. The new focus on environmental issues has been triggered primarily by the growing international attention on (threatened) external nature and the changes it is undergoing (*global environmental change*), as well as the consideration of those threats and changes on the political agenda and in large parts of society, and thus in most areas of study in sociology (Lidskog et al. 2015: 342).

Where interest continued to be lacking, major research funding bodies responded to the public's environmental concerns and helped by setting specific topics for investigation and calling for more interdisciplinary and internationally integrated research. Subsequently, environmental sociology acquired legitimacy even outside the sociological tradition through international collaboration with neighbouring disciplines and the natural sciences. In this context, theoretical perspectives that do not assume an a priori distinction and distinctiveness between nature, technology, and society are becoming more important, particularly in Science and Technology Studies. Such perspectives instead point to interactions and the permanent production of socio-technical hybrids (→ chap. 3 on society-nature relations). Nevertheless, a rather realist perspective on the environment still dominates in US environmental sociology, whereby the environment is at least partly seen as a biophysically determined reality. Since, from this perspective, the environment sets clear and identifiable limits to social development, many American researchers accept that they are dependent on the interpretations and calculations of the natural sciences for their work. In contrast, European environmental sociology, while not doubting the existence of this reality, focuses on its perception and interpretation in environmental debates and social practices in predominantly social construc-

tivist terms, and also critically reconstructs statements and analyses produced by the natural sciences. Rolf Lidskog, Arthur Mol and Peter Oosterveer (2015: 349) also observe that representatives of American environmental sociology are mostly critical of growth and engaged in environmental politics, while their European colleagues tended to critically examine and question environmental political engagement. In fact, much of environmental sociology is still strongly influenced—and in some cases paralysed—by ongoing realism-constructivism debates about the meaning of the interactions between nature and society as well as technology and society and the related epistemological issues.

6. The challenges facing environmental sociology in the Anthropocene

We have deliberately used the concept of the Anthropocene during this introduction, even though it has been heavily criticised from a social science perspective. This concept was brought into the discussion by atmospheric chemist and Nobel laureate Paul Crutzen in his highly regarded *Nature* article "Geology of mankind" (2002). In it, Crutzen warns of the ominous effects and long-term consequences of growing human influence on the environment and climate, and advocates for an "appropriate response at all levels", including major geoengineering projects for "climate optimisation" (ibid. p. 23). While he points out that only a quarter of the world's population is responsible for the environmental changes whose effects first and foremost threaten the other three quarters of the population, as a natural scientist he does not address the underlying inequalities and differences behind this relationship between the polluters and those affected.

More problematically, he is also insensitive to the worldviews and ways of acting that led to this situation, such as the unswerving belief that all problems can be solved using technology, on behalf of all humanity, by those who caused them, and without moving away from the structures that are driving the problems. These "structures", according to a variety of critiques, include an unleashed market economy that some authors call the "Capitalocene" (Bonneuil & Fressoz 2016; Haraway 2016; Moore 2017), oil-hungry democracies whose stability depends on growth and imperial exploitation (Mitchell 2011; Brand & Wissen 2017), and major infrastructure and utility systems whose sustainable transformation is at risk of failing due to technical, economic, and discursive path dependencies (Unruh 2002), as chapter 9 illustrates using energy and mobility transformations as examples. Further critiques of the Anthropocene concept include its anthropocentric focus on human-only concerns that overlooks the suffering of other creatures, the industry-fixated blindness to the long and diverse history (including, e.g., bacterial history) that led us to the Anthropocene, the unwavering belief in progress, and the invalid ethnocentric generalisation of the perception of the problem and ideas for possible solutions. Finally, the term is usually used unilaterally to focus on climate change, while other environmental problems that are occurring independently of climate change are hardly considered, such as the eradication of most living creatures (euphemistically called "species extinction"), the poisoning of soils and food, and the threats posed by nuclear waste, mono-

cultures, and resource depletion. These are some of the great challenges facing environmental sociology today.

There are considerable and sociologically challenging paradoxes associated with these challenges, which we explore in chapters 4 on environmental awareness and 5 on risk. To date, environmental threats have been least problematised by those who are most affected by them. Environmental awareness is evidently dependent on one's material prosperity—prosperity which in turn is contributing to the problems. Conversely, the most environmentally conscious segments of the population are regularly characterised by particularly environmentally damaging behaviour. As the German Environment Agency's Environmental Awareness Study from 2019 shows, the lifestyles of these population segments tend to involve heavy use of mobility, land and goods, making their resource consumption and emissions higher in almost all areas than those of social groups who take little interest in environmental issues. As a result, at both the household and national levels, the amount of climate-relevant emissions produced is a reliable indicator of prosperity. In particular, the lifestyle of the middle classes, which is the most aspired to globally and which is rapidly increasing especially in cities, is accompanied (despite the advantages of urban density) by an oversized ecological impact that must be overcome. However, technologies aimed at overcoming this and which promise to decouple productivity and resource consumption (such as energy-saving appliances and digital monitoring of resource flows) are often overcompensated by so-called rebound effects and provide financial, psychological and technological motivation for even higher consumption (Sonnberger & Gross 2018). All this makes it increasingly clear that quantitative prosperity is not compatible with the qualitative requirements of living well together within Earth's planetary boundaries (Richardson et al. 2023; WBGU 2011, 2016).

As the publicist Naomi Klein (2015) and the philosopher Bruno Latour (2018) point out particularly succinctly, however, in affluent Western societies economic constraints appear greater and more urgent in the short term than ecological problems and the questions of long-term survival associated with them. But if the previous productivity and growth-oriented guiding principles are called into question in the face of impending environmental catastrophes and a lack of success in overcoming them, the central tenets of scientific and political thinking will lose their validity (Latour 1996). This is why the field of transformative research was established in the new millennium, which we will present in the last chapter. It addresses the 21st century's key question on a wide variety of levels, namely, how can societies develop in a way that preserves the vital foundations they need to survive and thrive?

The size and complexity of the issue suggest there will be sufficient research potential in this field for the coming decades. In this context, it will be important to overcome the above-mentioned realism-constructivism gap in favour of investigations into sustainable transformation processes and their feasibility. To achieve this, environmental sociology will have to deal with conflicts and social movements (as it did during its emergence in the 1970s and 1980s): a field of research that we will discuss in chapter 6. While in some places it seems that

researchers consider it part of their duty to take a critical "counter-hegemonic" look at the dominance of neoliberal perspectives (Lidskog et al. 2015: 350), other sociologists are often reluctant to position themselves politically. They avoid proximity to environmental movements and political activists who have managed to have put ecological issues on the agenda. For all researchers in environmental sociology, the challenge is to operate in a highly politicised field of research, to be aware of the situatedness of one's own research perspectives, and yet to meet the demands of scientific quality criteria, without which science becomes obsolete.

In addition, there is another problem: In view of the global environmental problems and institutions, environmental sociology can only to a certain extent limit itself to the study of local, regional and national environmental problems, conflicts and measures. It must take global contexts and connections into account, in all their economic, political, and biophysical dimensions. Against this background, too, environmental sociology faces the difficulty of not only being confronted with (normative) questions of justice and fairness, but also with their various context-dependant formulations. Inter- and transdisciplinarity therefore characterise their working methods and increase the demands on their research, methods and the communication of their results. It is necessary to "realistically" take into account the scientific analyses of environmental and technological risks and to keep a "socially constructivist" eye on their situatedness and dependence on societal values and work perspectives, while at the same time looking beyond the academic horizon and "pragmatically" integrating the problem perceptions and proposed solutions which do not catch scientists' attention but which substantially shape the course of the environmental debate. In our view, in the face of these challenges, environmental sociology must neither barricade itself in an ivory tower nor lose itself in the melange of political actions. In many cases, it will therefore amount to a critical-constructive "public sociology" (Buroway 2005) that is connected to international and interdisciplinary networks and reflexively makes its disciplinarily well-anchored findings available to broad publics in aid of the necessary changes.

What students can take away from this chapter:

- Knowledge about nature and the environment as objects of interpretation and observation
- An insight into the fundamental tension between realist and social constructivist approaches in environmental sociology
- An understanding of the relationship between environmental sociology and other sciences that deal with environmental issues (especially the natural sciences and engineering)
- An understanding of the current challenges in environmental sociology in the face of global ecological challenges (Anthropocene)

Recommended reading

Beck, U., 1992: Risk society: Towards a new modernity. London: Sage Publications. *A classic of environmental sociology. It is still recommended today, because it unpacks the basic problem of what the ecological crisis means for modern society.*

Bonneuil, C. & J.-B. Fressoz, 2016: The shock of the anthropocene. *An introduction to the Anthropocene from a social theoretical perspective: these two historians raise awareness about the socioeconomic, socio-technical, and political backgrounds of unsustainable natural conditions.*

Latour, B., 1993: We have never been modern. *An important polemic of environmental sociology: What, so the question goes, if sociology as a whole, with the distinction between society and nature, would give in to a modernist self-deception as the source of ecological problems?*

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