Sociological Perspectives on Earth System Modeling

Reiner Grundmann¹ and Simone Rödder²

¹School of Sociology and Social Policy, University of Nottingham, Nottingham, UK, ²Department of Social Sciences, Institute of Sociology, Universität Hamburg, Hamburg, Germany

Abstract How can we understand climate change from a sociological perspective? In asking this question, we assume that Sociology has something to contribute to such an enterprise. The argument that we put forward is twofold: We argue that Sociology provides a much needed alternative to two dominant approaches that have influenced public discourse, behaviorist theories, mainly employed in Economics, and a belief in the centrality of science in policy making (“evidence first”), mainly entertained by physical scientists. We critically discuss both approaches, showing the limits of behaviorism and the linear model of policy making and provide an alternative framework, which emphasizes the role of social action, of organizations, and of structural differences between different social worlds. We then apply our framework to assess the role of evidence at the climate science-policy interface and the Intergovernmental Panel on Climate Change (IPCC) as a boundary organization in particular. We argue that science and politics follow different logics and that the IPCC is simultaneously both more political and less policy relevant than its self-description as “policy-relevant, never policy prescriptive” tries to make us believe. We conclude that a depoliticization of politics by IPCC expert advice and a politicization of climate science occur simultaneously and mutually reinforce one another. The result is a lack of progress in climate policy as science has taken center stage but is unable to offer political solutions.

1. Introduction

This paper contributes to the literature on the social scientific understanding of climate change with an interdisciplinary audience of climate researchers in mind. The argument that we put forward is twofold: We argue, first, that Sociology provides a much needed alternative to influential theories of climate-related behavior and, second, to influential views about the role of evidence at the science-policy interface in general, and the function of the Intergovernmental Panel on Climate Change (IPCC) in particular.

We proceed on the proposition that many public and policy debates on the link between Earth System Modeling and policy making operate under the assumption that climate science through scientific evidence and consensus can speak “truth to power.” We argue that such a linear model (We use “model” as a nontechnical term here. A “model” in our understanding is a conceptual tool to think, in this case, about the link between climate science, policy, and politics.) of policy making is itself part of the problem rather than the solution to the complex entanglements of Earth System modeling and its political context, because it looks at social problems with an engineering logic and overestimates the role and relevance of scientists and scientific evidence. This reliance might be traced back to the cultural authority of science and technology in our society in general, as well as to the successful agenda setting of the IPCC in the climate debate in particular.

In this paper we argue that Sociology provides a valuable alternative compared to behaviorist theories, mainly employed in Economics, and to flawed ideas about the science-policy relation, mainly entertained by physical scientists. Both reduce social science to “a form of applied behavioral engineering” (Brulle & Dunlap, 2015, p. 6; Shove, 2010). The structure of the paper is as follows: We first highlight the contribution Sociology can make in general to the climate debate (section 2) by introducing the concepts “social action” (rather than behavior, section 2.1) and “multiple-worlds-society” (rather than “global we”-society, section 2.2). We subsequently highlight the specific nature of climate change as a social (rather than scientific) problem (section 2.3) and then examine the nexus between science and policy making in particular (section 3). Using the IPCC as a reference point, we will discuss how climate scientists and their organizations as key participants in the climate change discourse operate under the assumption of a linear model, the “evidence-first credo” (section 3.1). We will then juxtapose this model with the multiple-worlds model to show in conceptual terms that the “predictions” of this latter model explain much better what we see...
From this follows that the IPCC is simultaneously both more political and less policy-relevant than its self-description as “policy-relevant, never policy prescriptive” tries to make us believe (section 3.3).

2. The Potential of Sociology to Understand Climate Change

2.1. Sociology as a Latecomer to Climate Change

The social sciences include many different disciplines, including Economics, Ethnography, Geography, Political Science, Sociology, and others. Important contributions have also been made by authors working in interdisciplinary fields, such as Science and Technology Studies, Communication Studies, and Environmental and Sustainability Studies. Most publications are found in journals that are interdisciplinary, and it is a difficult task to assign a disciplinary identity to an author who publishes in climate-related journals, but also in journals of their “home discipline.” Nevertheless, the relative contribution of some prominent social science disciplines shows that Sociology is much less visible compared to other disciplines (see Figure 1).

As Figure 1 shows, Sociology trails the attention levels of other social sciences, namely, Economics, Geography, and Political science. While Economics has become a major discipline in the study of social dynamics related to climate change through its subfield of Ecological Economics, and Geography combines physical and human dimensions, Sociology is even less visible compared to Political Science. A recent review of climate-related publications in the discipline’s core journals has shown that these journals still publish very few to no publications on the issue (Koerhsen et al., accepted).

The relative disinterest of Sociology in climate change is puzzling, given its role in academic research as well as considering the central role societies play in the causation of climate change, but also in the societal reflection and perspectives for social action (Bjurström & Polk, 2011; Victor, 2015; Yearley, 2009). In an important review of the state of the art, Brulle and Dunlap (2015:2) conclude that “the social sciences have had at best a marginal role” in the discourse on sources, nature, and impacts of climate change: “Despite the development of an extensive empirical literature that addresses the social dimensions of climate change, the social sciences—particularly Sociology—have not been well integrated into reports produced by the IPCC and other agencies.”

Likewise, John Urry laments the fact that two groups of analysts dominate the climate discourse, climate scientists, and economists: “the physical sciences and economics have got there first and dominate climate change analyses” (Urry, 2011:2). He forcefully argues against economic imperialism and stresses the need for sociological analysis. “Most of the time, most people do not behave as individually rational separate economic consumers maximizing their individual utility ... People are rather creatures of social routine and habit, but also of fashion and fad. ... People are locked into and reproduce different social practices and institutions, including families, households, social classes, genders, work groups, schools, ethnicities” (Urry, 2011:3–4).

This point is well taken. The discipline of Sociology studies social worlds such as science, media, politics, business, and civil society and relations between them. It studies social problems, their definition, framing, and construction (Spector & Kitsuse, 2001). It also studies inequalities of power, economic, and cultural resources and the conditions for both stability and change in society. In their conceptual approaches, sociologists can deconstruct dominant accounts of reality and widespread assumptions as popular myth and replace them with expert models of social phenomena. Eventually, the field is aware of two important distinctions: the distinction between describing reality and prescribing specific policies, and between detachment and involvement (Elias, 1956).

Sociology is not a discipline unified around one paradigm. It is multiparadigmatic and offers many different entry points for the climate change issue. It is uniquely equipped to observe, describe, and assess social dynamics on the societal macrolevel, such as functional differentiation, on the microlevel, such as ethnographies, and on the mesolevel, where work on organizations is carried out. Sociologists also study the role of culture and social change, how society contributes to climate change, and how it is affected by climate change. Finally, the framing of climate change is a topic of much sociological interest: How is climate change
made into a social problem? Which narratives, metaphors, arguments, pictures, and emotions are at play? How do social actors perceive the problem, and which solutions do they offer?

Well-known theoretical contributions from Sociology are risk sociology (U. Beck, 1992; Luhmann, 1989) and cultural theory (Douglas & Wildavsky, 1983). There are empirical contributions from closely related but interdisciplinary fields, such as Science and Technology Studies (Jasanoff, 2010), Science Policy Studies (Pielke, 2007), or Communication Studies (Weingart et al., 2000). In some work there is a tendency to mix scholarship with advocacy, often motivated to combat “climate denial” (Oreskes & Conway, 2011; Cook et al., 2013; for a critical analysis see Pearce et al., 2017).

Given this multiparadigmatic nature of Sociology, we want to make our own position clear at the outset. Our focus in this paper is the science-policy relation, exemplified by the IPCC, and our conceptual approach is based on the micro/macro/meso distinction of social relations. We will show that on the microlevel the concept of agency is crucial and why this matters. On the macrolevel structure is the key term which denotes the constraints provided by the context of individual action which are not open to change in any given moment. On the mesolevel we locate organizations which mediate between the micro and macro level. We will apply this conceptual framework, using the concepts of “social action” for the microlevel, “multiple-worlds” for the macrolevel, and “organization” at the science-policy interface.

2.2. Social Action, the Behaviorist Model and Its Shortcomings

Let us start with the concept of agency. This simply means that social events involve actors that interact. Actors have interests and motivations for their actions and react to others with similar or different interests and motives. The notion of social action is not the same as another term that is often used when talking about society: behavior. Behavior is a category frequently used by economists and psychologists. It denotes the routines of people who do what they do for some rational reason, based on information. It also denotes that the link between reason and action is stable. If the reason for action can be identified, it can be manipulated. Providing the right information to someone has the potential to change their behavior.

Sociologists are critical about these models (Brulle & Dunlap, 2015; Shove, 2010). They think that social actors cannot be understood like mechanisms that react to information in a predictable way. The notion of social action emphasizes that it is meaning based. Social actors have intentions and motives, interests and values. These interests and values are linked to what they do, but not in linear, stable, or deterministic ways.

The above mentioned “people” are typical units for economists and psychologists. The sociological critique of these individualistic approaches is less directed toward the content of this research but takes issue with how it is used “in the formulation of policies and recommendations for action” (Brulle &
Dunlap, 2015, p. 10). The concern is that economic and psychological perspectives can “easily be (mis) used to reinforce the societal tendency to focus on individuals as both the primary cause of, and solution to, climate change” (Brulle & Dunlap, 2015, p. 10; see Wynes & Nicholas, 2017, for an example). In contrast, a key sociological insight is that social action is also possible for corporate actors, which is to say groups of people who act together, or individuals who represent a larger unit. Groups of people who act together are civil society groups like neighborhood committees, nongovernmental organizations, labor unions, political parties, and the like. Individuals can also represent a larger unit and be identified with this unit: a president or monarch is a natural person and represents a state; a CEO is a natural person and represents a corporation (Kantorowicz, 1957). In these examples we deal with hierarchies in organizations where the pinnacle is seen as pars pro toto. Decisions by the heads are attributed to the whole organization. In this sense organizations and institutions can act (Douglas, 1986). It is important to note that corporate actors wield more power in social life than individual actors. It is in rare historical circumstances that the collective action of the many (individual actors) prevails over the concentrated power of the few (corporate) actors.

But society cannot be understood as an organization (see also Rayner, 2017). Modern society does not have a top or center, out of which a “global we” could be articulated. To be sure, binding decisions are taken in the world of politics, but this is not equivalent to steering both individual and collective actors. Political decisions need to be implemented if they are going to be effective. Many different organizations are involved in these processes, and often, the policies are revised or abandoned. What is more, political decision making is influenced by many sources and pressure groups (not predominantly science).

These insights seem to be ignored by behaviorist models, which postulate that people need to be informed and educated about problems and their solutions. This involves educators (often scientists, government agencies, and nongovernmental organizations) who engage in campaigns to create public awareness which are supposed to lead to changes in attitudes and behavior change. The United Nations Environment Programme issued a list of behavior changes individuals could take to “kick the CO2 habit.” Elizabeth Shove (2010:1280) pointedly commented: “In identifying “Twelve steps to help you kick the CO2 habit” and in aiming to give “a human face to environmental issues” and empower “people to become active agents of sustainable and equitable development,” the United Nations Environment Programme’s World Environment Day places responsibility squarely on the individual CO2 addict and in the same move deflects attention away from the many institutions involved in structuring possible courses of action and in making some very much more likely than others.”

“Kicking the CO2 habit”—the reference to addiction—is not by accident. There are several studies that understand climate policy issues in the same way as the regulation of smoking tobacco (e.g., Oreskes & Conway, 2011, for a critique see Grundmann, 2013). In both cases science is believed to be instrumental in initiating and justifying policy change. In both cases resistance to change from vested interests (tobacco companies, fossil fuel companies, and their lobby groups) explains lack of progress. In both cases barriers to individual behavior change need to be removed, and relevant scientific information needs to be provided. The history of smoking and the introduction of partial smoking bans shows a different picture (Brandt, 2007; Schudson & Baykurt, 2016). It was mainly nonsmokers’ activism that led to changes in policy. They organized their actions in pressure groups and developed arguments against air pollution from smokers. Their efforts prevailed in the courts, which led to a smoking ban in public places in many countries. It would be an exaggeration to state that science was driving this process. Antismoking groups claimed their right to clean air against the right of smokers to pollute. Medical concerns about the health effects of second-hand smoking played a role, but this was minor. Collective action was an important element in policy change, with legal decisions establishing new rules of social life.

While this is an example of many individual actors getting organized in pressure groups and prevailing over corporate power, it does not mean that climate change can be understood in the same way. While it is possible for smokers to “kick the habit,” it is not possible for individuals and business enterprises to stop emitting greenhouse gases, at least not in the short term. In the absence of alternative energy infrastructures the habit will continue. This indicates that the analogy to the tobacco issue, where collective action was possible and successful, does not hold with regard to the problem of climate change.
2.3. Multiple Worlds and Linear Views

Turning to the notion of structure, we observe that it is widely used, also outside the social sciences and beyond. It commonly denotes some stable order that cannot be altered by will, at least not in the short term. Whereas agency (actions and their effects) can to some extent be directly observed through empirical methods, structures are often invisible, lying beneath the surface of social life. Structures influence, enable, constrain or determine social action (Bourdieu, 1977; Giddens, 1984). Marx famously established the view that the capitalist economy structures societies. Likewise, Freud claimed that the unconscious structures our conscious thoughts. We may not be able to directly observe these structures but can infer their existence and efficacy from their consequences.

Sociologists have long been interested in stability and change of the most encompassing of all social structures, society itself. This is the realm of general social theory that tries to understand the social order of society as a complex social sphere on the macrolevel (complex here means encompassing all values, all interests, all knowledge, and all action, see Luhmann, 2008:203; for a systems-theoretical definition of complexity, Luhmann, 1995:24 and for implications for the scientific study of complex systems Weaver, 2004 [1948]). General social theory, according to many of its proponents, conceptualizes the social order of contemporary societies as a multiple-worlds order, or, in sociological terms, an order of functionally differentiated social spheres. The metaphor of multiple-worlds illustrates that society’s major parts and their institutions are organized around specific functions next to one another rather than in hierarchical order, and in contrast to former (stratified or tribal) forms of societal differentiation. Put casually, society has needs that are met by social worlds built just the way to fulfill these functions. The individual worlds—specified as “Wertshären” (Weber, 1917), “fields” (Bourdieu, 1998) or “systems” (Luhmann, 1997) in different conceptual approaches—include, but are not limited to, the political system, economy, science, mass media, religion, education, art, and the legal system. Each of these worlds is highly functionally specialized in doing what it does (policy making, scientific research, news reporting, and so on). Simultaneously, and precisely because of their degree of specialization, they are highly interdependent and a multitude of interfaces and boundary organizations exist. We suggest to analyze the IPCC as an example of a boundary organization (see section 3).

So far we have dealt with the influential framing of the climate problem by economists. The dominance of the physical sciences has led to another influential framing, which is based on scientific and engineering terms and understanding. Here problems and their solutions can be clearly defined, including measures of success and effective tools. This mode of problem solving is seen as the basis of engineering and innovation within firms and in society more generally, despite the fact that it has been shown to be empirically inaccurate in many instances (see Cohen et al., 1972). Nevertheless, it became widely adopted and was also tacitly and without much reflection applied to the many social problems that went hand in hand with industrial capitalism. But not all problems can be solved in this way—we need to distinguish between tame engineering problems and “wicked social problems” (Prins et al., 2010; Rayner, 2017; Rittel & Webber, 1973) or between well-structured and ill-structured problems (R. Hoppe, 2010). In many narratives about climate change and climate policy there is an implicit assumption that we could “solve” climate change, just like the project to “put a man on the moon.”

2.4. Climate Change as a Wicked Social Problem

Let us assume we have no objection to “putting a man on the moon,” to stick to this famous example (Hoppe, 2010; Nelson, 1977). Scientists and engineers were able to define what it would take to achieve the task, within a given time frame and budget. There were clear targets, technologies, programs, and measures of success (by no means do we suggest the task was trivial). But this familiar story is not a scenario that normally applies to social problems, and it does not apply to all technical or science problems either (Newman & Head, 2017).

Trying to solve social problems, like unemployment, drug abuse, crime, or obesity, social researchers found that there is no way to plan the reduction of these undesired problems or to completely eliminate them. Our carbon dependency is one of those problems, and it does little good if we start campaigns to “kick the habit.” Researchers studying urban problems have coined the term “wicked problems” to characterize such issues that defy solutions that are timely, measurable, and implementable (Crowley & Head, 2017; Rittel &
Webber, 1973). Sarewitz and Nelson (2008) have convincingly shown that there is a difference between a class of cases where we have instruments, which allow us to solve problems in a timely, manageable, and implementable way and those where such instruments do not exist. In the former class there is usually a “technical core,” which paves the way to a solution, in the latter class there is not. They use vaccination policies as illustration of the former, and education policy and climate change as illustration for the latter. They write:

“In the case of reading, ... [a] diverse set of actors and institutions remains in a continual state of conflict regarding how best to improve performance, and the education system itself is often blamed for the lack of improvement. Our point is that performance could improve despite system complexities if a broadly effective method of teaching reading were developed. The problem is that decades of effort have not led to such a method. Different approaches to improved teaching remain strongly context dependent, and no particular approach confers an obvious advantage over others in all circumstances. Adherents of every approach have citable evidence to back their position, reinforcing their sense that “the system” is the problem.” (Sarewitz & Nelson, 2008: 871).

In the vaccination example, by contrast, we do have the instruments to implement solutions that work, a so-called technical core which can be incrementally improved, that is, vaccines.

Consider now climate change. It is often perceived as an issue for science and technology and therefore exempt from the pitfalls described in the previous paragraphs. A common view is that there are technologies available to “solve” the climate issue; that is, in other words, climate change is a technical problem, which can be solved in a timely, measurable, and implementable way. However, our point is that climate change resembles the reading example more starkly than one might think. While there are technologies which contribute to global warming and others that help reducing it (and in this sense climate change is a technical problem), there are social aspects which are most important. The reader will be familiar with the many aspects of climate change, the social practices that cause it (energy provision, transport, agriculture, industrial production, etc.) and the many solutions that have been proposed. Below we list 12 such proposals which are political, economic, technical, moral, or a combination thereof (Grundmann, 2018):

1. rolling out nuclear power plants across the globe;
2. switching all energy supply to solar, wind or biofuels;
3. taxing carbon (or energy) with a) low or b) high rates;
4. implementing emission trading systems;
5. developing carbon capture and storage technologies;
6. develop new zero carbon energy systems that are affordable and have little environmental impact;
7. taking adaptation more seriously;
8. developing geo-engineering projects;
9. adopting vegetarian or vegan diets and lifestyles;
10. restricting population growth;
11. abolishing capitalism;
12. abolishing democracy.

Some of the suggestions go together, many contradict each other. Observers have pointed out that some of these solutions might be worse than the problem (Biello, 2010; full disclosure: one of the authors is on record of recommending a combination of 3a and 6, see Prins et al., 2010). These 12 options are far from exhaustive; we listed them merely because they are fairly frequently mentioned in scientific and public discourse. The point we are trying to make is that there is no solution that would be accepted as the most reasonable or rational by a large proportion of the electorate, by business leaders, green pressure groups, or political decision makers. Different social worlds cluster around a combination of these options, with no clear fault lines, and no uncontroversial way of differentiating between sound or unsound (“good” or “bad”) solutions. They are part of a political discourse and contestation. Perhaps most importantly, there is not one technical core which would be fundamental to the solution of the problem, and which could be refined over time to do the job better and better.

Concluding this short overview, we should emphasize that assumptions in academic and public discourse are problematic, especially assumptions about “behavior change.” This may be motivated by the wish to
help society do the “right thing,” by, for example, fighting climate denial, or “nudge” individuals into the right kind of behavior. But it needs to be recognized that simple behaviorist models have a very limited role to play in understanding the problems at hand and in devising robust and legitimate solutions. We have also shown why climate change cannot be understood as a science (“tame”) problem but needs to be understood as a social (“wicked”) problem. We now turn to the organizational level of analysis.

3. Reassessing the Link Between Earth System Science and Policy Making: Modeling, Evidence, Consensus, and the Politics of the IPCC

With its assessment reports, the IPCC aims to provide “policy-relevant but not policy-prescriptive” (IPCC Secretariat, 2010) scientific guidance to global climate policy (see also Edenhofer, 2014). Situated at the interface of science, public policy and global publics, the IPCC is the prototype of what social scientists call a “boundary organization” (Guston, 2001; Miller, 2001), which is typically a place of conflicting expectations (Merton, 1976). In the IPCC case, the ideal of global geopolitical representation and the thrust for political control of expert advice (Grundmann & Stehr, 2012: 186ff) are juxtaposed with requirements of scientific autonomy and quality control (S. Beck, 2009). With this framework in mind, the social science literature—while often being critical of the IPCC process—concludes that the panel has been rather successful in putting “the climate problem” on the global political agenda (S. Beck, 2009; Gupta, 2010). It might be rooted in this initial agenda-setting success that a widespread view emerged that scientific consensus is able to facilitate, if not determine, political action in the climate case and thereby settle its political controversy. “By positioning all actors on a baseline of shared knowledge, [...] climate change should have moved by the turn of the century toward the low-conflict, strong-consensus end of the political action spectrum.” (Jasanoff, 2011: 129).

Yet the question is: Can we envisage that there is a direction in which information flows between any of these worlds? Who has the power in these constellations? Many commentators see the role of science in policy making as central, or at least think it should be. Typically, they envisage a chain of causal links, which start with scientific knowledge which is then introduced into contexts of application (technology or policy), and finally taken up by audiences, consumers, or decision makers. Much has been written about this “linear model” and its conceptual problems (Godin, 2006; Pielke, 2007; Sarewitz, 2000; S. Beck, 2011; Rayner & Malone, 1998) and we will base our analysis of the climate science-policy interface on this critique.

3.1. First Predict Then Act: The “Evidence-First Credo” in the Climate Debate

Upon the adoption of the Paris Agreement in December 2015, the Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC) decided to request a special report on the impacts of global warming of 1.5 °C above preindustrial levels from the IPCC (UNFCCC, 2015). The panel in April 2016 decided to accept the invitation and to prepare a Special Report on this topic in the context of strengthening the global response to the threat of climate change, sustainable development and efforts to eradicate poverty. However, critics pointed out that time and resources would be better spent rethinking climate targets and reassessing their function in science and policy making (Geden, 2016) and that trying to distinguish between a 1.5° and 2° target is an “exercise in false precision” (atmospheric scientist, personal communication). Some in the climate science community questioned the meaning altogether of producing “a report on a long-term target that it (the climate science community) knows is unattainable” (Guillemot, 2017: 52 and FN 13). Meanwhile, however, the assessment cycle for the Special Report (SR1.5) has been completed with the Report’s publication in October 2018.

While some climate historians have pointed to a shift from a predominantly “science-driven coproduction” at the climate science-policy interface, which led to the 2° target, to a solely “policy-driven coproduction” in the case of the 1.5° target (Guillemot, 2017: 52, see also; Randalls, 2010), a key premise of the global science-policy interface in climate governance remains firmly in place: that more evidence with more certainty and more consensus will more successfully inform policy making. It is thus worth to closer scrutinize the underlying model of the link between climate science, policy, and politics.

Since its initial agenda-setting success, the IPCC provided a model of scientific policy advice on a global scale, which has inspired subsequent global environmental assessments (S. Beck, 2011; S. Beck et al., 2014). Yet arguably, developments in the global climate regime do not quite go to plan. The IPCC assessment
reports have been around for decades, they are available to all, but they happily coexist with vastly different national climate policies (S. Beck, 2012; Jasanoff, 2011). What is more, global emissions and global temperatures have been rising. How can sociological thinking contribute to explaining the political stagnation that we have witnessed in global climate policy? Drawing on the science-policy literature and the multiple-worlds model presented above, we argue that the frequently invoked understanding of the link between science and policy making as a problem of a linear “translation” of scientific agreement into policy decisions is itself a part of the problem. While the value of having expert knowledge in technical matters is undisputable, this linear view overemphasizes and overcharges the role and relevance of scientists, knowledge and consensus in the world of politics (Sarewitz, 2011; Wynne, 2010).

In this contribution, we label this linear model the “evidence-first credo” of the science-policy interface to emphasize the temporal order of the interface as one where we first need the evidence to then successfully inform policy making. We think it is worth emphasizing the time dimension here because of the political function it acquired: Policy makers have been exploiting “waiting for a new assessment report” as an apology for nonaction while scientists over many years have been emphasizing the need for urgent action because it is “5 minutes to midnight” (Geden, 2018: 381).

This linear thinking has a long history in the climate change debate. In 1993, the U.S. Global Climate Change Research Program stated that “[a] better understanding of the science of climate change is critical to determining the appropriate global mitigation and adaptation policy” (as quoted in Sarewitz, 2000: 81). Similarly, in 2006, the Max Planck Gesellschaft in Germany stated in a research plan that “It is the long-term goal of this research to develop an understanding of the Earth system that allows us to comprehend the changes in the world around us and to respond to them in an informed manner. This is the only way to find out which political and economic measures are urgent and critical for the protection of the Earth system, and how the natural resources of our planet can be used both optimally and sustainably. A solid scientific understanding of the interrelationships in the Earth system is also a basic prerequisite for convincing politicians and society at large of the necessity of difficult and far-reaching measures, such as a drastic reduction in CO2 emissions.” (Max Planck Gesellschaft, 2006).

Both statements establish a correlation between two social phenomena: the soundness and accuracy of climate science on the one hand, and on the other hand, the support which is expected to justify unpopular policies. The implicit assumption thus is that more and better knowledge will be more policy effective and the temporal order of the model is “we first need the knowledge upon which we can then act politically,” or shorter, first predict then act. This assumption is absurd but usually goes unnoticed because, as Sarewitz notes, the linear model of policy making “seems to conform so strongly to the way societies have framed the climate change issue, and to more broadly held notions of rationality and action, that what might seem bizarre is that I am bothering to recognize it in the first place as anything other than the way things simply ought to be done when addressing any difficult problem.” (Sarewitz, 2011: 476).

A variant of the model reads that it is essentially consensus that makes scientific knowledge authoritative (for a critique Hulme, 2013; Jasanoff & Wynne, 1998). A related view sees the main issue in a failure to effectively communicate the consensus view: “The IPCC’s failure to communicate its conclusions directly and effectively to policymakers and the public is perhaps one reason why the public in the United Kingdom and elsewhere does not appreciate the scale of the scientific consensus on man-made climate change, with potentially profound consequences for policymaking.” (Black, 2015: 282). Like the behaviorist belief in the power of information, this view expects that communicating the correct information in an efficient way will make all the difference.

As introduced above, the “evidence-first credo” is known as the “linear model” of the science-policy interface in the social science literature (S. Beck, 2011; Jasanoff & Wynne, 1998; Pielke, 2007; Sarewitz, 2000). The model not least implies that “the scientific aspects of assessing risks can and should be kept apart from the value-laden task of managing risk” in areas of uncertain, contested knowledge (Jasanoff, 2011:133). This view is echoed in the IPCC’s claim to be “policy-relevant but never policy prescriptive.” This setup also prescribes defined roles to scientists and politicians, respectively. Using the metaphors of mapmaking and navigating, scientists are expected to stick to the role of mapmaking, while politicians do the navigating, as Edenhofer and Minx (2014) put it: “From such common understanding, the IPCC can further inform international climate policy without prescribing and predetermining future negotiations.” The wish to speak
truth to power or to provide maps for political navigation while being largely unaffected by politicization broadly underlies scientists and science institutions’ engagement at the science-policy interface (another example is Kirchner, 2017). However, this neat separation does not hold in practice as the Summary for Policymakers of the IPCC shows. This document is agreed between scientists and governments, which means that the maps are not purely scientific constructs: Politicians are engaged in mapmaking. The institutional setup of the IPCC as a boundary organization linking science and politics ensures that not only scientists have a say about the content of these important documents. This being so, the “evidence-first credo” and assumptions of a linear relation between science and politics are profoundly mistaken. This will be the point of the next section.

3.2. Risks of Communication: Implications of the Multiple-Worlds Model of Society

What is the model of society that underlies the “evidence-first-credo” of the link between climate science, policy, and politics? It is bound to assume that there exists an input-output relation between science and politics and that society has a center or a pinnacle (such as a “global we”) out of which society can—informed by scientific evidence—perceive ecological dangers, act upon them, and adopt more appropriate dealings with its environment. As Wellstead et al. (2017: 391–2) have put it, there is a “strongly felt belief of many scientists ... that policy-making responds to evidence in a clear and direct fashion and that their findings in the area of climate science ... should automatically be translated into policy recommendations and outputs.” Not only scientists adhere to this view. As we have shown above, economists tend to view information as a causal factor in changing people’s behavior.

There is another misconception at play in this, apart from the effect of information on behavior. This has to do with the idea how society works. Several commentators, even from the social sciences, try to find optimal arrangements for the science-policy interaction (not to close, not too distant; improving participation and communication etc., see Thoni & Livingston, 2019 for a recent example). But as we have argued above (2.3), one cannot conceptualize society as a whole as a collective actor of the type organization. It is also, in our view, oversimplified to use “distance” as a measure to differentiate between one-world and two-world positions on the science-policy interface, as Sundqvist et al. (2017) have proposed. The multiple-worlds model, in contrast, suggests that the worlds of science and policy follow rather different institutional logics: politicians adhere to scientific advice for political reasons, or they do not adhere to it for political reasons. And scientists strive to find evidence for their theories and hypotheses, even if they are politically inconvenient. This establishes specific meanings for political and scientific action which we call binding decisions and knowledge respectively.

However, scientists may still want to see their recommendations implemented in policy, assuming that all politics is, or should be, evidence based—and that the IPCC has been set up to facilitate this process. We want therefore raise one final point about the relation between science and politics, pointing to “risks of communication” (Weingart et al., 2000) which are inherent to the process of communication across social worlds, that is, they cannot be once and for all eliminated based on more knowledge, awareness, or education.

“Risks of communication” emerge as the different worlds recreate the meaning of information such as scientific evidence in their own terms. It is therefore unrealistic to assume that evidence will travel seamlessly from one world to another and linear models such as the “evidence-first credo” are not helpful in guiding how scientists think about their link to the world of policy and politics. The multiple-world-model instead calls for an acknowledgment of these communicative risks as inherent to science-policy debates. We will thus conclude with exemplifying these risks for the case of the IPCC.

3.3. Speaking Consensus to Power: On the Knowledge Politics of the IPCC

The principle of functional differentiation lets to think of the science-policy interface not as a zero-sum game such as in the linear “evidence-first” model where there is somewhat less scope for political action (or more legitimation for inaction) due to the imperative “first predict then act.” The multiple-world model, in contrast, opposes any linear and deterministic view of the relationship and argues for more complex theorizing of the science-policy interface. A theoretical figure put forward by systems thinking is that in the multiple-worlds-society, there is simultaneously more influence of science on politics and more influence of politics on science (Luhmann, 1995: 176ff). We will not further engage with the conceptual debate but spell out what this view implies for the IPCC. From the multiworld model follows for the IPCC case that the panel
is eo ipso both more political (or policy-prescriptive) and less policy-relevant than its claim to provide a science base that is “policy-relevant yet not policy prescriptive” tries to make us believe.

The IPCC is more political because “the art of assessment making” (Edenhofer & Minx, 2014: 38) includes more than to merely “summarize” the results of peer-reviewed research. We have pointed to this already above when we commented on the process by which the Summary for Policymakers is negotiated and the underlying report accepted. Many scientists are convinced that “speaking with one voice” is important in order to be politically effective (I. Hoppe & Rödder, 2019). The consensus policy of the IPCC is an example of what Weingart has described as attempts “to control the influx of knowledge [into policy processes] and thereby the delegitimizing effect of contradicting pronouncements of scientific experts” (Weingart, 1999: 159). IPCC assessment making in practice includes selection processes (Minx et al., 2017), orchestrates consensus (for an example from the TAR WGII see Grundmann, 2006 FN 24), more or less directly influences research agendas (Guillemot, 2017) and publication strategies (Hughes & Paterson, 2017), is dominated by natural science perspectives (Bjurström & Polk, 2011) and, arguably, has led to the accumulation of power and authority around Global Climate Models based on the promise of using them to set emissions reduction targets (Demeritt, 2001; Heymann & Dahan Dalmedico, 2019; Mahony & Hulme, 2016; Shackley & Wynne, 1995).

With regard to public and policy debates, “the place of the sciences in the climate issue thus cannot be reduced to diagnoses and assessments: In defining the problem, they also contribute to defining the proposed solutions” (Guillemot, 2017: 41). But if public meanings of “the climate problem” are imposed by the science, “[t]his gives rise to perverse effects on public readiness to take informed democratic responsibility for “the global climate problem,” and associated crosscutting issues which existing scientific framing of public policy erase from view.” (Wynne, 2010: 289). As an example, Beck and Mahony have recently examined the case of the IPCC scenario Representative Concentration Pathway (RCP) 2.6., which held huge political significance in the run-up to the Paris COP conference. They conclude that this significance was “performative” rather than representative because pathways and scenarios do not just “represent” possible futures, but they also help to bring certain futures into being. Reflecting on the introduction of the technical option of BECCS (bioenergy with carbon capture and storage) into IPCC scenarios they argue that “we need to ask whether the significant presence of BECCS in RCP 2.6 and the political significance of RCP 2.6 make a BECCS-inflected future more likely” (S. Beck & Mahony, 2017: 312). Beck and Mahony conclude that the IPCC thus regularly engages in what they term “politics of anticipation.” Another facet of this is what Hulme has called “climate reductionism”: “In its crudest form, [it] asserts that if social change is unpredictable and climate change is predictable, then the future can be made known by elevating climate as the primary driver of change.” (Hulme, 2011, p. 265).

At the same time, the policy-relevance of the IPCC can only go as far as to where it encounters the logic of the world of politics, and every scientist who has been involved in policy advice has experienced that. Since 1990, the IPCC has issued five assessment reports, most recently IPCC AR5 in 2013/2014. In roughly the same period, global CO₂ output has increased significantly (Ripple et al., 2017, Figure 1). While COP conferences take place and confirm old and even set new, more ambitious targets, these targets are rarely backed up by policy instruments to achieve them (Aykut et al., 2017; Geden, 2016, 2018). It is fundamentally misguided to see the reason for this in too little evidence or too little consensus (E.g., Betsill & Pielke, 1998). As Jasanoff has pointed out, “the mere fact that scientists are speaking as if with one voice on a particular issue may be highly relevant, but not dispositive, when it comes to persuading global publics of the need to act.” (Jasanoff, 2011: 131). But because climate science has been such a successful agenda setter, expectations that climate scientists would also be able to provide political solutions are still high and, in the logic of “evidence first” fed by attempts to quantify how much consensus there is (Oreskes, 2004, 2018; for a critique see Pearce et al., 2017). Our sociological reading, in contrast, suggests that scientific knowledge alone is rarely effective in compelling public policies and that political action, or nonaction for that matter, follows from political reasons. It might be more appropriate to think of scientific consensus as serving a policy function and to expect of IPCC reports that they are put to use as “sources of quotes with which policy makers legitimate their preferences.” (Geden, 2015: 28; see also Weingart, 1999: 156).

The mutual influence of science on politics and of politics on science implies that a depoliticization of politics by expert advice (making climate science the focal point and major ingredient in climate policy debates) and
a politicization of climate science (by scientific consensus) occur simultaneously and reinforce one another (Luhmann, 1995: 176ff; Kuchler, 2013; Weingart, 1999). The establishment of the IPCC has situated both processes and centered them on global assessment reports. This setup has been critiqued as the “postpolitical approach” by scholars who have argued that the depoliticization of the discussion of climate change “reinforces the existing socio-politico-economic status quo” (Brulle & Dunlap, 2015: 12). Swyngedouw (2010: 215) characterizes the postpolitical approach as being “structured around the perceived inevitability of capitalism and a market economy as the basic organizational structure of the social and economic order, for which there is no alternative. The corresponding mode of governmentality is structured around dialogical forms of consensus formation, technocratic management and problem-focused governance.” What we have called the “evidence-first credo” is a case in point of the technocratic depoliticized discourse on climate change, as it assumes that political progress in dealing with climate change requires convincing people about the science (Sarewitz, 2011: 478). “Evidence first” means that science, in the first place, prescribes a certain policy, or in other words, that climate policy relies on the authority of scientific consensus and that, second, the public need to believe the science because they might not like the policy. Giving people the relevant information will change their belief and behavior is what we have identified as a core element of behaviorist approaches. As a consequence, those who oppose the prevailing climate policy regime often express their dislike as distrust of the science (Sarewitz, 2011: 475). This major social climate-related dynamic again is not taken up in the postpolitical approach. As Brulle and Dunlap note, one can “read the entire set of IPCC assessment reports and not encounter any analyses of the widespread effort to cast doubt on climate science.” (2015:12f). The “evidence-first credo” furthermore implies that the authority of scientific consensus is vulnerable to the exposure of exclusionary practices and active “consensus-making” such as in Climategate (Hulme, 2013: 146).

Simultaneously, the setup of the IPCC in general and its consensus policy in particular politicizes climate science. As Weingart states, “given the legitimating function of (authoritative scientific) knowledge in politics, the general accessibility of that knowledge has led to a competition for expertise which intensifies controversies in policy-making rather than alleviating them” (Weingart, 1999: 152). For the climate case, Haas has argued, that with the establishment of the IPCC in 1988 and ever since, governments wanted to control scientific statements on “an issue which was accelerating on the policy agenda more rapidly than most leaders in the North were comfortable with.” (Haas, 2014: 580). While a linear model would see a straight line going from one body of evidence to policy formulation, our interpretation suggests that the relationship between knowledge and policy making is much more complex. It includes, as stated in section 2.1, issues such as how problems are framed, whether there is a technical core that the knowledge can act upon (Sarewitz & Nelson, 2008), and the number of answers that it provides (Grundmann, 2018; cf. Weingart, 1999: 156). Betsill and Pielke have pointed out that “within different policy processes, the concept of “scientific consensus” takes on different meanings that are a function of how the process relates science with policy action” (1998: 160) and that the questions needs always be with respect to what there is consensus. For the case of climate change, Grundmann has argued that “the consensus pertains to minimalist statements such as those that observed temperature increases are most likely the result of human activities,” while there is “no consensus on the likely climate sensitivity which would be an important piece of information in order to calculate future costs and benefits” (2018, p. 15: 437). On the research side, at the cutting edges underneath the top layer of the IPCC’s “scientific consensus on climatic change,” more, and more specialized science typically produces contradictory evidence and hence complicates the knowledge base: “If scientists are doing their job, then “more research” in the short term is invariably a prescription for raising new questions, problems, and uncertainties—for preventing, not achieving consensus.” (Sarewitz, 2000: 85; see also Hulme, 2013: 144f). It might be worth pondering the question in how far climate modelers might be tempted to not “do their job” because of the political focus on consensus that they now grow up with.

4. Concluding Remarks

In this paper we have sketched a sociologically informed approach to climate change and climate change policy. Acknowledging the multiparadigmatic character of Sociology, we have opted for an analytical framework of microlevel, mesolevel, and macrolevel of social reality, to which correspond our key concepts of social action, organizations, and social worlds. We have taken aim at two influential framings of climate change, behavioral change, and evidence first. We suggest an alternative approach, which shows the
limitations of behavioral accounts, and emphasize the role of individual and collective action. In doing so, we identify the nature of climate change as a social problem, which is addressed by various social actors at different levels. At the most profound, structural level, we have identified the different logics and expectations in the worlds of science and politics which make the successful working of “boundary organizations” precarious.

Functional differentiation of societal institutions helps to understand why—despite IPCC consensus and also considerable public and policy debate—“wicked” environmental problems cannot be solved once and for all, but can only be considered from many perspectives, and then dealt with politically based on many considerations, among them scientific evidence. Multiple social worlds create multiple realities making scientific knowledge (as one of these realities) one ingredient in complex policy processes. The multiple-worlds model is thus a sociologically informed alternative explanation to the usual blame game between scientists and politicians, or the scapegoating of deniers, or “too balanced” reporting by the news media.

Linear models such as the “evidence-first credo” are not helpful in guiding how scientists think about their link to the world of policy and politics. The multiple-worlds-model instead calls for an acknowledgment of communicative risks as inherent to the science-policy interface. Boundary organizations such as the IPCC cannot escape this harsh reality. This conclusion challenges an inherent optimism in the literature on boundary organizations, with some analysts playing down the risk of politicization of science and scientization of politics: “The politicization of science is undoubtedly a slippery slope. But so is the scientization of politics. The boundary organization does not slide down either slope because it is tethered to both, suspended by the coproduction of mutual interests.” (Guston, 2001: 405).

We, in contrast, conclude that in the climate case, the entanglement of science and policy making (more precisely the science of Global Climate Models and the global politics of the UNFCCC framework) simultaneously leads to a depoliticization of politics by IPCC expert advice and a politicization of climate science. First, predict than act is a case in point of the depoliticized technocratic thinking of the postpolitical frame (Swyngedouw, 2010, 2011). Climate policy relies on the authority of scientific consensus and the public need to believe the science because they might not like the policy. As a consequence, those who oppose the prevailing climate policy regime often express their dislike as distrust of the science, and the IPCC for that matter. The result of this depoliticization is a lack of progress in climate policy as science has taken center stage but is unable to offer political solutions (Grundmann, 2018). More, and more specialized, research usually produces contradictory evidence and hence complicates the knowledge base. More knowledge provides resources for many different policy options. Yet the range of these options is limited by the postpolitical paradigm to those in conformity with existing social, political, and economic structures (Brulle & Dunlap, 2015, p. 13). Oftentimes, the focus on individual behavioral change that we have criticized above serves political interests well, as it obscures the institutional and structural dimensions of climate change (Brulle & Dunlap, 2015, 13f.).

Boundary organizations at the science-policy interface are by now established in several controversial policy fields, with the IPCC being hailed as a role model at the global scale. This indicates that political pressure to provide useful knowledge is typically dealt with at the organizational level. But a politicization of a social world may occur if the boundary organization passes on a specific policy—such as the consensus principle—to the field rather than shielding it from political demands. On the science side, therefore, the political focus on consensus may be detrimental for the field of climate sciences (as suggested by, e.g., Weingart, 1999). It is an open question if we should be optimistic or pessimistic about the effects of the politicization of science and scientization of politics. As the pressure mounts on the IPCC to perform more solution-oriented assessments (S. Beck & Mahony, 2018; Haas, 2017), these developments require scholarly attention. While sociologists have work to do in shedding more light on the nature of the mutual processes of depoliticization of climate politics and the politicization of climate science, climate modelers are called to self-critically look into this mirror that Sociology provides.

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