Post-Normal Practices Between Regional Climate Services and Local Knowledge

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ABSTRACT

Recent surveys show that the communication about climate change between science and the public is severely disturbed. In this article we discuss this problem in focusing on both regional climate services and other, local forms of knowledge. The authors suggest that climate science and its public services have to critically revise their own practices and to acknowledge other forms of knowledge about climate as constitutive. Based on approaches from geography and anthropology, the article first discusses the short history and "normal practices" of regional climate services and how they approach the public. Outlining the potentials and constraints of this concept, the article focuses on the friction, on "its openness to change as it rubs up against society" (Hulme 2007). The focus then shifts to local knowledge systems and how they deal with the challenges of a changing climate. In addition to the "extended peer review" as a new option for climate research in a post-normal setup, the authors discuss the possibility of an "extended knowledge basis," that is, the integration of different forms of climate knowledge with a special focus on regional populations.

KEYWORDS

cultural anthropology, extended knowledge basis, geography of science, local knowledge, localizing, multi-sited approach, post-normal practice, regional climate service, regional climate service

Introduction

As recent surveys show, the communication between climate science and the general public is severely disturbed. There is a decline in the public concern about climate change, even though the consensus among climate scientists about the reality of climate change as well as media reporting is increasing (Ratter et al. 2012; see also Figure 1). Short-term changes of attention in recent years have been attributed to factors such as information fatigue resulting from intensive media coverage or recent cold winters (Krosnick 2010). In addition, scandals such as Climategate, the modest results of the Copenhagen and Dur-

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ban COP-negotiations, and claims of misrepresentation by the Intergovernmental Panel on Climate Change (IPCC) might have also contributed to the recent decline of attention. But the long-term tendency is another question; there have to be found different explanations in science communication that go beyond the current day-to-day explanations.

In this article, we ask for the reasons of this divergence and how it might be overcome. In our opinion, this gap cannot be bridged by normal routine such as improving science communication, presenting more evidence, or investing in better pedagogical concepts for education only. As the long-term tendency shows, the crisis is deeper and demands a general evaluation of the current state of climate communication. Our starting point is the assumption that scientific climate as a form of global observation based and modeled form of knowledge has lost connection to the experience and perception of climate and weather by people in their everyday life. While scientific climate models have traveled successfully across geographical and cultural boundaries, local climate knowledge only slowly gains scientific recognition. Global climate models and their regional counterparts neither reflect nor match the climatic reality people inhabit; instead, they have gained a life of their own and represent a powerful tool to organize the unequal relationships between different parts and groups of the world.

For analyzing the encounters between scientific and local climate knowledge, we chose the example of regional climate services. Regional climate services are either a branch of national climate services or else a form of outreach or "farmshop" of highly specialized climate research institutes (von Storch et al. 2011). In most cases, regional climate services are intended to be a "normal" institutionalized practice to inform people and to "speak truth to power"; once informed, politics in turn will organize necessary measures to adapt to climate change and initiate mitigation. But for the geographer Mike Hulme (2009: 81) there is no doubt that the appliance of climate science fulfills all the criteria of post-normal science as defined by Funtowicz and Ravetz (1993; see also Bray and von Storch 1999). Indeed, we argue that climate services deliver knowledge charged with high degrees of uncertainty; values are in dispute, stakes are high and decisions are—more or less—urgent. In analyzing climate service as a post-normal practice, we outline climate communication between climate science and the public as a multi-level and open process, which permanently has to adapt to both the meteorological and societal changes in process.

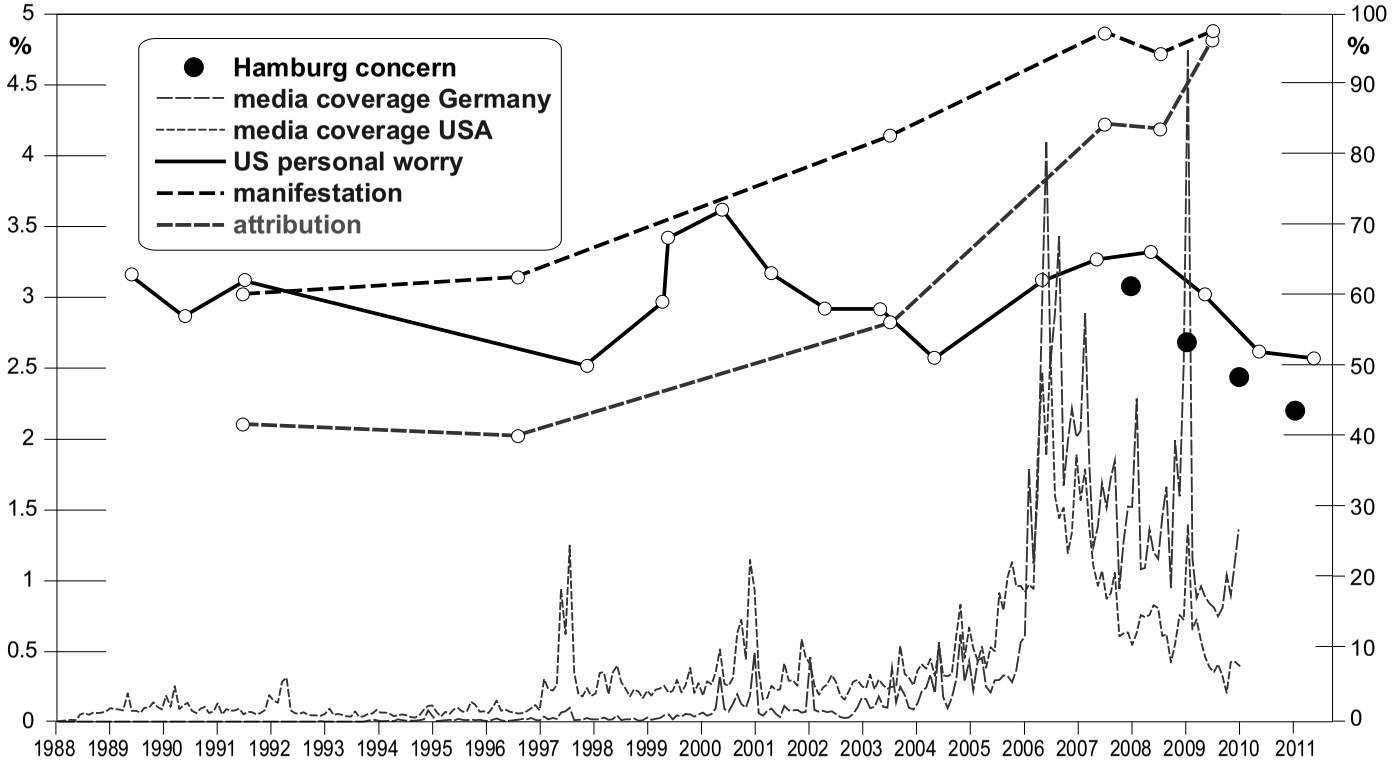

Figure 1 ■ Temporal development of a number of indicators. Black dots—serious concern in Hamburg about climate change; bold black line—serious concern in the United States according to Gallup (Newport 2010); bold dashed lines—confidence in the climate science community that the warming is real (manifestation) and that the cause is man-made (attribution) according to Bray (2010), and light dashed lines—below normalized presence of newspaper articles in the United States and Germany with terms like "global warming" (Reiner Grundmann, Aston University, personal communication 2011). Please note that the media coverage represents temporary estimates (Copyright: Hans von Storch).

Until recently, social and cultural sciences mostly abstained from researching the relation between society, on the one hand, and climate and weather, on the other (von Storch and Stehr 2006). This is also true for research about everyday interactions with weather and climate in different cultures, about the cultural meaning of extreme weather events and other forms of local forms of knowledge about climate and weather. There are historical reasons—mainly the ills of climate determinism and eugenics—why the social sciences prefer to explain the social mainly via the social and shy away from natural explanations. In addition, until recently, weather and climate were seen as belonging to the terrain of natural sciences, which in turn tend to show a certain reluctance to acknowledge any kind of research from the cultural and social sciences. Thus, interdisciplinary communication resembled the one between current climate science and the public: there is room for improvement. At least, social and cultural sciences have regained interest in climate and weather, and they increasingly are getting heard. For our purpose, we can rely on a considerable body of work from geographical and anthropological studies of both science and local knowledge (for an overview, see Crate 2011; Hulme 2009, 2011).

In addition to Ravetz's argument for extended peer review as one element of post-normal science in the digital age, we argue for the extensions of the knowledge basis when it comes to regional climate services. The question is no longer to only educate the public about the results of climate science on the expense of "wrong" folk believes; instead, the challenge is to connect scientific climate knowledge to the everyday reality and perceptions of climate and weather of people living in vulnerable areas. Our goal is to outline the consequences for climate research, its practices and its place in society when local knowledge gains increasing ground and becomes an integral part of regional climate service as a post-normal practice.

Outline

In the first part of the article, we introduce the concept of regional climate service as it developed in the United States and is today, besides the work of non-governmental organizations, one of the main tools of disseminating climate knowledge worldwide. Based on recent research from the geography of science, we discuss the seemingly objective and neutral tools of climate service as both local and cultural prac-

tices, which tend to reduce the future to climate (Hulme 2011). In contrast, we introduce cultural climatology, which presents climate perception in art and everyday life, as both contrast and necessary missing link to scientific perception of climate.

In the second part, we switch to the anthropological perspective of climate, weather, and climate change. We introduce the anthropological perspective and climate ethnography, and we discuss the reality and importance of local or indigenous knowledge, which is often only considered as either a rivaling knowledge claim or simply erroneous and in need of improvement. Relying on ethnographic studies, we outline that indigenous people in rural areas closely observe their environments and simultaneously are highly receptive of scientific knowledge. Finally, we give a short example of regional climate service from our own area of expertise in Northern Germany and argue that scientific downscaling has to be complemented with ethnographically informed localizing of climate.

Regional Climate Services: A Critical Assessment

The concept of "climate service" emerged in North America, first with publications in governmental documents in the early 1980s and earlier (for a historical perspective, see Changnon et al. 1990; DeGaetano et al. 2010; Miles et al. 2006). Originally, climate service was provided by weather services and similar operational organizations, mainly dealing with forecasts, seasonal outlooks, and assessments of risks in a mostly stationary but variable climate. The idea of establishing climate services on both national and regional levels resulted from the growing concern over the consequences of climate fluctuations, on the one hand, and the difficulties of providing and distributing adequate information, on the other (Changnon et al. 1990: 527). Ideally, the main tasks of climate services are to provide climate information for stakeholders, education for the general public, to design decision support tools and technical assistance, and finally to propose adaptation strategies (Miles et al. 2006).

The Linear Model

Recent evaluations of US government's Global Change Research Program have revealed many deficits in the interaction between science

and policymakers or the public; deficiencies are also present in ambitious climate programs (Meyer 2011). In climate science, there is still a linear model of science—society interaction prevailing, which has been discredited in science studies as inefficient. In a general sense, "linear model" serves here as "a metaphor or model to explain the relationship of science and technology to societal needs," based on the assumption that there are no barriers in the transformation of basic research into development, which finally leads to societal benefits (Pielke and Carbone 2002: 398; see also Pielke 1997, 2007). This "magic bullet" approach fits well with early "Global Environment and Society" models as proposed by Hasselmann (1990), which promise that knowledge about the dynamics in the earth-society system together with an understanding about the incurred costs for adaptation and mitigation, finally "solve" the climate problem. Furthermore, they are supposed to provide decision makers with directions on how to rationally and cost-effectively respond to the perspective of anthropogenic climate change (see Nordhaus 1991). This idealized and top-down understanding of science—public interaction is part and parcel of climate services. More often than not, science is presented as monolithic knowledge provider, free of conflicts about the quality of data and the nature of facts, and that climate service presents "authoritative" information about "climate variations and trends and their impacts on built and natural systems" (Miles et al. 2006: 19616).

Geography of Science

Recent studies in the geography of science from Great Britain, and especially the path-breaking work of Mike Hulme and colleagues, fully reveal the ambivalence inherent in the practice of climate science. Although climate services indeed provide relevant data and information about current and future climate-related issues for specific regions, their climate models are also powerful tools that replace other forms of knowledge about climate. In the hands of a small epistemic community, they reduce the future of specific regions to climate only; according to Hulme (2011), this reductionism is the translation of historic climate determinism into the present and future.

Hulme sees mainly three different historical developments at work, which shape the approach of disseminating hegemonic knowledge about climate: "The rise of a powerful epistemic community of climate modelers, the asymmetrical incorporation of climate and social

change into envisaged futures, and, confounding the whole enterprise, the lack of theory making around climate—society interactions" (2011: 264). An epistemic community in the context of climate knowledge shares sets of beliefs and values and draws policy conclusion mostly from the use of climate models, which are at the center of earth system sciences. Those epistemic communities and their models have a history, a geography, and a sociology of their own, and their existence is according to Hulme (2011: 258) closely related to wider institutional, social, and political settings. From the Cold War, when climate science developed, there is a direct line over the interest in human-induced climate change to the United Nations Conference in Stockholm 1972 and finally to the current hegemony of the IPCC.

In the IPCC reports, Hulme identifies a dominance concerning predictions of climate over political or social futures. There was never developed an adequate methodology or even interest for the relevance of technological, organizational, ecological, or social conditions and values for the present and future; instead, "current intellectual endeavors in this area unduly privilege climate as the chief determinant of humanity's putative social futures" (Hulme 2011: 264).

In another article, Mahony and Hulme (2012) follow in a very practical way the mobility of this knowledge, which is actually contained in a model developed for regional climate services all around the world. In form of an ethnographic study or investigative journalism, the authors interview the developers of the model PRECIS from the Hadley Centre, and they follow its migrations, its epistemological and geographical boundary crossing. The model is intended to aid adaptation processes to a changing climate, and it is already used in more than 100 countries, where people are trained to use it. With its help, it is possible to visualize future climates; politics can prepare for necessary adaptation processes, while the model provides its users equal access to the global epistemic community and to the hegemonic global climate discourse. But according to the authors, this does not come without a price: "But while PRECIS has the potential to empower, it also has the capacity to disempower, through the extension of a dominant epistemology that may freeze-out other ways of knowing the climate and of anticipating change" (Mahony and Hulme 2012: 209).

Recent studies especially in the field of the geography of science have clearly demonstrated the ambivalence of this kind of both globalized and regional climate service and the appliance of its tools in different cultural contexts. But how do these above-mentioned "other ways of knowing the climate and of anticipating change" look like?

How are climate and weather perceived in different cultures, and how is local knowledge expressed in everyday talk, in arts or other forms of representation?

Cultural Climatology

For a long time, social and cultural sciences were reluctant in "studying the social and cultural processes of speaking about climate change, of the formation and using of lay knowledge, of the formation and social functioning of mental images, icons and popular explanations of climate and its interaction with people" (von Storch and Stehr 2006: 112). Georgina Endfield followed this advice in her article about the British meteorologist Manley, "whose goal was to encourage such a culturally driven and local-scale consideration of climate as an expression of the 'integrated experiences' of weather in Britain in the mid-twentieth century" (2011: 161). This kind of "cultural climatology" (Endfield 2011: 145) closely links weather events with biographical experiences, cultural practices, and belief systems and easily becomes an integral part of what is perceived as regional or national identity. The Icelandic artist Olafur Eliásson puts this cultural mechanism to perfection in his various weather projects and installations, where weather becomes a sensory experience and opens up a social space. Eliásson's projects and representations of weather and climate as hybrid phenomena are an example of what Latour (2011) calls "composing a common world through art and politics."

Anthropology of Climate Change

Through the door of experience every man and woman can walk easily; it always leads to culturally shared experiences and become an integral part of the construction of cultural identity, of creating a sense of belonging to a region, city, or landscape. It is only a fine line that separates climate determinism from being "entangled in weather worlds," as the anthropologist Tim Ingold (2008) puts it. It is only a small step from representations of weather events in art or everyday talks about the weather to the way people deal with seasonal and longer climatic influences. Anthropology has a long tradition of observing how people cope with their environmental, ecological, and climatic surroundings. Though it served for a long time mostly as a

background for the observation of culture, there is a recent tendency toward an explicit anthropology of "weather, climate, culture," as indicated by the title of a path-breaking reader edited by the anthropologists Sarah Strauss and Ben Orlove (2003). The above examples may appear as the random opposite of the standardized and exact climate models, but in fact they serve as an entry into the understanding of local forms of knowledge of populations in areas affected by the effects of past, current, or future climate dynamics and change.

Indigenous Knowledge

"Indigenous knowledge" is mostly understood as a place-based form of local, vernacular, or traditional knowledge "that is rooted in local cultures and generally associated with long-settled communities which have strong ties to their natural environments" (Orlove et al. 2010: 244). While indigenous or local knowledge is often understood as the other of scientific knowledge and considered as deficient, there are many examples that prove this assumption wrong. For example, Benjamin Orlove demonstrated with a group of anthropologists as the result of long-term fieldwork, how farmers in Uganda make their decisions each season about the choice of crops and when to plant them based on both indigenous and scientific sources. The anthropologists observed closely the multiple components of indigenous knowledge, such as historical experience, the everyday observation of weather, and regional networks of information. At the same time, there is great openness toward scientific meteorological information.

There are also limits to mutual understanding between science and local knowledge, for example, when it comes to sorcery and witchcraft as sources that influence the occurrence of weather phenomena. But, as Orlove et al. (2010) remind us, there has been more often than not a productive mutual exchange for example between indigenous healing practices and Western medicine. Both sides can learn from this dialogue across cultural knowledge systems, which is even more true concerning climate science, considering the often times stupendous knowledge about local and regional manifestations and impacts of weather, of seasonal cycles, and of inter-annual variability in societies whose subsistence practices are highly depend on their environment. Again, there is the possibility of mutual exchange with residents delivering necessary local data for climate science, while simultaneously being open for scientific information on the fu-

ture development of the regional climate. Thus, climate science should conceptualize indigenous people not only as consumers of scientific climate knowledge, but also as agents who are requesting, testing, and providing knowledge. This applies both to farmers in Uganda as well as to inhabitants of low-lying coastal regions in Northern Germany.

Seeing scientific and indigenous knowledge systems as mutually connectable instead of mutually exclusive also affects the understanding of adaptation. Orlove convincingly shows how discourse on adaptation easily turns into a kind of currency for the international climate community, while its practical value tends to stay diffuse. Adaptation does "not always capture the full impacts of climate change and … does not always represent accurately either the perceptions of the people affected by these impacts or the range of alternatives open to them" (Orlove 2009: 131). Thus, successful implementation of adaptation measures has to be based on a dialogue between science and local and regional stakeholders. For this purpose, knowledge brokers need to understand both scientific and indigenous knowledge and have to take into account the sometimes competing differences between these knowledge systems.

Climate Ethnography

Archeology and environmental anthropology have a long tradition in exploring climate change and culture, but with the advent of current anthropogenic climate change, there is a new sense of urgency and necessity to engage local to global contexts. In her review article, Susan Crate (2011) coined the term "climate ethnography" for the systematic exploration of how local and indigenous cope with the challenges of climate change. According to Crate, current climate change introduces two new distinctive features into the agenda of anthropology, "namely an unprecedented sense of urgency and a new dimensional level of reflexivity, both of which demand anthropological engagement that is cross-scale, multistakeholder, and interdisciplinary in research and practice" (2011: 184).

Anthropologists are more often than others aware of the urgency when they document dramatic changes in the environment of field sites, which are extremely vulnerable to climate change. Thus, climate ethnography "is tied in a new way to the global phenomenon and communicates a sense of immediacy and of an ethnography with a mission" (Crate 2011: 185). What Mike Hulme (2007) called "its

openness to change as it rubs up against society" becomes here a multi-scale dimension; the rub or "frictions," as the anthropologist Anna Tsing (2004) calls it, connects the local with the origin of the anthropologist in a new way.

But how to bridge the gap between the field site and the origin of the anthropologist, as well as the scalar disparity between the distanced, objective standpoint of science and the local one, which is based on the interpretation of the "insider"? Instead of traditional research in one locale only, climate ethnography necessitates so-called multi-sited ethnography. According to Marcus (1995), "ethnography moves from its conventional single-site location … to multiple sites of observation and participation that crosscut dichotomies such as the 'local' or the 'global,' the 'lifeworld' or the 'system'" (as cited in Crate 2011: 185). In practice, this means that for example both the production of scientific knowledge as well as of indigenous knowledge has to become the object of ethnographic scrutiny. The scientific and the social world are not distant and unconnected, but mutually connected and integrated. To understand climate change as a simultaneous global and local phenomenon, anthropologists have to follow actors from various and on first sight seemingly unrelated sites "in their effort to define global climate change and localize it in the 'real' world" (Krauss 2009: 152).

The need for interdisciplinary practice is a great challenge for anthropologists, who are used to work as "loners" and are known to be too slow for the serial production of knowledge in natural sciences. Conversely, there is no way to get around those mutual collaborations and to engage in common projects: "Anthropology not only plays a central role, but also carries a large responsibility in bringing about this transformative epoch via its unique capacity to identify, track, describe, interpret, and communicate the human predicament" (Crate 2011: 188).

Case Study: Regional Climate Service as a Post-Normal Practice

The Northern German Climate Office provides climate information for the general public along the coastlines of Northern Germany (Meinke and von Storch 2008). It serves as a kind of "farmshop" that provides the results of climate research at the highly specialized Institute for Coastal Research of the Helmholtz Center.

Natural sciences normally deny their social histories, but here it is important to remind that before climate research, ecosystem studies were one of the main activities in this institute. When the tidal flat area of German's North Sea coast was declared a national park in the mid-1980s, its legitimization derived from these ecosystem studies. In the conflicts surrounding the implementation of this national park, coastal inhabitants showed protest signs saying that the coastal area serves "as a livelihood for fishermen and not as a playground for researchers" (Krauss 2006: 40). Thus, there is already a historical lesson on how normal scientific practice turns into a post-normal activity; researching the ecosystem of a tidal flat area is not much different from downscaling regional climate from global climate models. The decisive turn is when this knowledge becomes policy relevant and has to stand the test of practice and public scrutiny.

Another turn on another scale are the resulting collaborations among coastal research, climate science, and anthropology in various projects between the two authors of this article. Those projects include the comparison of scientific and local perceptions, the ethnographic study of the "tribe of coastal researchers and climate scientists," or exploring the differences between downscaling regional climate and localizing it in the real world (Krauss 2009). Other research dealt with the self-description of coastal populations (Ratter et al. 2009). These studies helped us to understand climate service as a post-normal practice.

As ecosystem studies before, climate service is indeed a post-normal practice that has to take into account that its own knowledge is uncertain—the climate office consequently offers projections of future climates and not predictions; and while the stakes are high and values are in play, decision are not urgent, but they will have to be taken some day. Predictions say that in more or less thirty years from now, measures have to be taken because of sea level rise in order to ensure safety along the coast. One of the climate scientists suggested in a newspaper article to give up some of the islands in the long run, to open dikes partially, and put houses in the flooded polders on dwelling mounds. This immediately raised protest: Will climate change once again turn the coastal landscape into a playground for scientific research?

In those coastal landscapes, the management of coastal protection is at the very center of society and has a long tradition of its own. The maintenance of the dikes, for example, is historically an organizing principle of those coastal societies and is deeply involved in many

aspects of social life. Each change in this system affects many other issues of societal relevance such as the management of resources, water, agriculture and societal institutions. These practices, mostly based on customary law, are the cultural heritage of this landscape and are closely related to question of identity, belonging, and ownership (Krauss 2006). There is no use in just delivering general data about sea-level rise; instead, those data have to become part of the regional "parliaments of things," as Latour (2004) calls the multiple assemblies, which organize space, the public sphere, and communal practices (Krauss 2010).

In order to have a voice and be heard, climate science has to deliver data and insights of relevance for exactly these regional circumstances, and those data have to be presented with all the caveats, uncertainties, and complexities included. In those cases, downscaling from global climate models to gain knowledge about regional climate developments is only one side of the coin; the other one is localizing this knowledge in the social and cultural setting where people live, deeply entangled in climate (Krauss 2009). To paraphrase Mike Hulme, once climate service is taken seriously, it can no longer be left to climate scientists only; it is one task to provide regional climate models and climate information; it is another one to create common ground with those who inhabit, shape, and administer the coast. Seen from this perspective, climate service is a post-normal activity encompassing global epistemic communities and local everyday experience of weather. In each and every case, climate service means tracing the networks and entanglements from the global to the local and making public, how and what kind of knowledge travels along these lines. There is no mechanism providing a standardized way to bridge the gap between science and the public; instead, the appliance of knowledge means laying bare its production on all levels and actively shaping the connections in order to create common ground. Anthropology teaches many lessons, and the most important is that there is a huge variability in dealing with the effects of climate change.

Conclusion

In this article, we started with the present persistence of even decline of public interest in anthropogenic climate change (see Figure 1) and ended up in outlining post-normal practices between climate services and local knowledge. These practices involve a great variety of actors,

strategies, networks, and potentialities. Thus, the original question served as an incentive to follow the tracks of climate communication from global epistemic communities to farmers in Uganda, or from downscaling of regional climate models to localizing climate change in the landscape-mentality at the German North Sea coast.

While it is impossible to quantify our assumption, we suggest that the present decline in public interest is to some extent a result of the drifting apart of scientific discourse and the everyday experience and perception of climate and weather. Furthermore, we identified the top-down attitude of epistemic climate communities who pretend to "speak truth to power" as a source of misguided climate communication. This approach is also inherent in the focus on regional climate models as the single approach to cope on local or regional levels with problems of adaptation and mitigation.

For regional climate services, one important task is to provide scientific knowledge and to initiate communication. Two points are of special importance:

> One is to explore the range of perceptions, views, questions, needs, concerns and knowledge in the public and among stakeholders about climate, climate change and climate risks. The other task is to convey the content of scientific knowledge into the public, to media and the stakeholders. This includes communicating the limitations of such knowledge, the known uncertainties and the unknowable, as well as the limited role of science in complex decision processes. (von Storch et al. 2011: 8)

In order to fulfill these prescriptions and to find links between regional climate services and local knowledge, we introduced geographical and anthropological approaches to analyze climate change as a hybrid phenomenon. These disciplines provide insight into the practices and interactions of climate research, climate services, climate models, local perceptions and strategies, as well as into the encounters and resulting frictions between these diverse actors. In doing so, the dichotomies of global and local, expert and indigenous knowledge, science and the public increasingly dissolve into a network of multiple actors who share the same interest, which is to gain common ground and to face the challenges of global climate change. Furthermore, the monoculture of climate models is in this post-normal approach replaced and expanded with an "extended knowledge basis," in analogy to the "extended peer review" as suggested by Ravetz (this volume).

In order to root climate change in society (Krauss 2011), it is necessary to include the social and cultural disciplines into climate research (Stehr and von Storch 1998; von Storch and Stehr 1997). So far,

this was often understood simply as the need to include social data in the construction of emission scenarios, or to determine optimal emission paths for meeting certain goals of limiting anthropogenic climate change. In this view, social and economic research was understood as somehow subordinate to climate change analysis. The mismatch between science and the public, as well as the existence of sometimes erroneous perceptions of climate change on the side of the public and of the social and cultural dynamics on the side of climate science, are characteristic for the current climate debate. Social and cultural sciences are in particular needed to study the ubiquitous politicization and cultural conditioning of competing knowledge claims, including scientific ones.

Post-normal practices between climate service and alternative systems of knowledge, such as local or skeptical ones (see van der Slujis, this volume), include multi-scale, multi-sited, and interdisciplinary expertise. In order to create common ground, the representations of climate change in art, politics, and different cultures have to be included into the realm of these post-normal practices. Climate change has to be re-established as a serious issue and matter of concern in the public sphere; not as the ubiquitous icon for "save the world" movements, but as a significant component when discussing and planning the future. The monoculture of climate models has to be supplemented and enriched by a multi-facetted and interdisciplinary exploration of human existence as entangled in climate and weather.

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