

# Social Science - A Must for Climate Research

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## 1. *Nico and me wandering through climate ...*

Nico Stehr and me met first in about 1992, or so, in Cecilienhof in Potsdam. The newly founded Potsdam Institute of Climate Impacts Research had brought together a group of people, whom one thought may help to bring together the natural science side of climate research and the “societal dimension”, whatever this may mean. So, there were we two, a physical climate scientist from the Max-Planck Institute of Meteorology, where we naively played around with ideas how climate change may affect societies, and a social scientist from Calgary, who knew something about the social process of science, Nico Stehr. I do not remember anything about the meeting itself, but Nico offered a good opportunity to interact with people, who were not just dabbling physicists. After a while, we even found out that we could speak in German to each other. Then I invited him to come to our institute in Hamburg for a couple of months, and he accepted this invitation.

What did we natural scientists think then back in the early 1990s? None of us had any education in social or cultural sciences; we had heard a few courses in environmental economy, had read Nordhaus’ “To slow or not to slow”. We thought that it would be possible to include society in our models, just another model component, which would interact deterministically, possibly with some stochastic components, with the natural system comprising the atmosphere, the ocean, vegetation and the carbon cycle. That we would be able, at least in principle, to estimate optimal measures, which would balance the need for reducing the intensity of man-made climate change and the need for reducing societal vulnerability against changing climate conditions. The role of the political process would mostly be the determination of an appropriate metric apart of avoiding free rider problems. In its core, this argument represented simply climatic determinism. It assumed implicitly that societal development would be governed by certain laws. The role, which we assigned in these days to social and cultural sciences, was to formulate these laws, and to provide parameters for modeling such as demographic data and the usage of resources.

Then came Nico. He gave a talk on ... – I am not sure. I mostly remember the set-up of the talk. He had asked for an overhead projector, as was common for us natural scientists at the Max-Planck Institute. We were sitting and waiting, when he came in – and then he sat down. An unheard action; we give our presentation standing up, in front of the screen going through our transparencies. Nico had a few transparencies, but they only served as decoration on the wall. And then he read his manuscript. He read it – and we had to listen.

Unfortunately, we were not used to that – we were used to look at diagrams, think about it, have our thoughts wandering around, and eventually return to the diagrams, compact hypothesis and conclusions on the transparencies. But Nico read, read!, and we were lost, at least I was lost, I guess almost all. Two cultures met the first time, and it needed some time to get the interaction going.

I do not really remember what his talk was about, but he did not provide us with laws of social development and response to climatic change, no parameters to estimate emissions or vulnerability, but very likely he spoke about Emmanuel de Roy Ladurie's book "*Times of Feast, times of famine*", the case of the wet summers in England in 1315-17, when harvests failed and the religious authorities instituted a climate protection policy of the time, a successful policy as it had to be perceived. This case was an eye-opener to me, and my apprenticeship at Professor Stehr began, then in 1993. It is almost 20 years ago, and I am deeply thankful to Nico for what he has taught me.

We started with using this case of 1315-17, as an example to illustrate that the issue of man-made climate change would not be a new concept, that the idea of adopting measures to end the catastrophic consequences of our misdoings – manifest in an adverse climate – was thought before, but in a framework entirely senseless for our enlightened times. My question was – would generations to follow find our explanations and measures equally strange, as we considered the activity of the Archbishop of Canterbury some 700 years earlier?

The first thing we wrote was a piece in the German weekly ZEIT. The title was "*Genarrt vom Wettergott*", and we wanted to see if others had thought about this link before. The response to this article was meager, and apart of Wolfgang Settekorn, a media scientist at the University of Hamburg, no significant contact emerged. A full article was published two years later in the journal *Climate Research*, and we continued with other work, such as climatic determinism and the case of Eduard Brückner. And we continued to publish shorter articles in newspapers and weeklies to encourage exchange with other segments of the public and of sciences.

Brückner was an important step in our understanding, because it told us that the present perception of man-made climate change and the need to mitigate was something which has happened often in history, and the issue of deforestation in the 19<sup>th</sup> century was in many aspects similar, albeit smaller in extent, to the current concern about ongoing man-made climate change. We made it in to a short article in *nature* in 2000: "*Climate change in perspective. Our concerns about global warming have an age-old resonance*"

Another important line of research was related to climatic determinism – with the concepts of Ellsworth Huntington in the center. Ellsworth Huntington was a US geographer from Yale, who tried to present the classical climatic determinism in modern scientific clothes, with maps, statistics and the like. He demonstrated the similarity of global maps of

presumed level of civilization and the utility of regional climate for creating favorable working conditions. Not surprisingly, the two maps pointed both to western Europe and parts of North America, while Africa and most of the rest of the world obviously suffered from unfavorable climatic conditions and needed support from the regions with favorable conditions – in short colonialism. I was surprised to find “my” good climatology in the neighborhood of racism.

The case of Brückner, the climatic determinism, as well as the case of the Bishop of Canterbury’s mitigation policy in the 14<sup>th</sup> century, demonstrated me very clearly that social construction processes really matter when talking about climate, climate change, climate impact and climate policy. Scientific construction processes are intertwined with these social construction processes - if you allow me for the time being the separation of the two types of processes. My friend, the ethnologist Werner Krauss, would claim that all such construction processes would be cultural. Indeed, but there are differences. I will return to this later. A significant element of the parallel existence of such constructions is the parallel existence of terminology – climate means something different in the social understanding than in physical understanding.

For Nico, this was of course clear right away, and he insisted from the beginning of our cooperation on Gernot Böhme’s concept of “social natural sciences”, that any climate science needs to be embedded into an understanding of social and cultural dynamics, that the understanding of the physical dynamics would be conditioned to some extent by our cultural world. For social scientists trivial, for us natural scientists an insult, as we are objective, we claim. Following Merton, so to speak, but Nico’s early work from 1978 on the social reality of Merton’s norms showed us otherwise.

We condensed all this into our “Wetter, Klima, Mensch”-book, which came out first in German in a small book in 1999; now it has been translated to Chinese, Russian, Slovenian and English, and a revised and extended 2<sup>nd</sup> version is on the market.

## **2. *Climate science as a physical approach?***

As an initial educated look tells us, the scientific analysis of climate is mostly a physical science discipline. The actors are physicists, meteorologists, oceanographers, geographers; also ecologists and economists are joining in the last decades, and the older concept of a climate model is more and more replaced by an Earth System model.

The traditional object of climate science is not a social construct but part of the real world that is governed by physical principles, such as conservation of energy, momentum and mass in hydrodynamics. Thus, the climate science field contains the “physics of the climate system”. When we add terrestrial and marine cycles of matter, of ecosystems, other natural science concepts are getting involved.

All this is good conventional natural science – with its being confined to schools of thought, of paradigms, of the ubiquitous presence of alternative knowledge claims, from pre-scientific, outdated to molded by world views and particular interests. We natural scientists consider ourselves as objective, independent of our history, equally open to all ideas, always prepared to accept our view falsified by new observations and findings. However, we are not, as Ludwik Fleck and STS studies have taught us.

For one of our latest papers, Nico and I have teamed up with a theoretical physicist, Armin Bunde from Giessen, and analyzed if climate science would be mostly a kind of subfield of physics, and we concluded – yes, it includes many elements of physics, albeit not necessarily in a conventional way, and, no, there is more, in particular on the side of social and cultural studies. This paper became a chapter in *The Oxford Handbook of Climate Change and Society*.

The situation becomes more complex, when the product of the knowledge construction, the wissenschaftliches Wissen, becomes an asset in political debates: when stakes are high, decisions urgent, the uncertainty remains high and values are in dispute. We call this situation, following Silvio Funtovicz and Jerry Ravetz *post-normal*. In this situation science becomes politicized, and policy “scienticized”. It is no longer only the scientific method, which qualifies a result but also the value as an argument in a political debate, a debate about values; on the other hand, political decision are perceived not as mostly a matter of cultural preferences and values, but a mere “must” provided by natural sciences. Symptomatic are calls, which discuss whether autocratic systems are better in dealing with environmental crises than the slow democratic system, which is built to balance different worldviews, assessments of risks and possibilities, preferences and values.

Post normal situations are common in case of environmental issues, among them climate. The *uncertainty* is large and will remain so for an extended time; if the sensitivity of the climate system (the equilibrium temperature increase caused by a doubling of CO<sub>2</sub> concentrations) is 2K, 4K or 11K will be known only in a few decades - same with the development of the big ice sheets Greenland and Antarctica , or trends related to tropical cyclones, the spreading of diseases and the fate of ice bears. If we want to limit climate change and the sensitivity is high, then we need now to reduce emissions massively; if we think that the sensitivity is lower, we may have more time doing so. But the decision of implementing significant measures has to be taken today – think of the rhetoric of COP-15 in Copenhagen. The decisions are *urgent*. Obviously such decisions have costly consequences: the *stakes are high*: if we do not mitigate enough, the damages may be prohibitively high, while un-needed mitigation may limit other urgently needed investments, say in the provision of electrical power for the poor. Do we need to act now to prevent challenges from future generations, or do we want to create wealth now as basis for future prosperity? This is a *value* decision, closely related to the question of how to deal with risks.

The postnormal situation goes mostly unnoticed for natural scientists, who become actors in a political conflict, while believing to be objective; they get desperate, because the political system does not follow the suggestions and requests of “science”, which recently became more and more publicly voiced orders by an elite of climate scientists. But the policy processes do not follow these grand calls of re-organizing global economics, of the great transformation, of efficient global mitigation, whereas science seems to have a profound effect only on more piecemeal activity of regional mitigation and adaptation.

To conclude: A significant part of the set of issues represented by “climate” is deeply embedded in social and cultural processes, in particular the field of society-climate interaction. Thus, climate science is a genuinely trans-disciplinary scientific field, which poses special challenges and approaches requiring the skills of both physical and other natural science professionals as well as social and cultural scientists.

While the climate science began its ascent as a conventional natural science quest for understanding real world dynamics, it is now dealing with both, “physical reality” and social constructions thereof.

### **3. *What is needed from social and cultural sciences?***

There are a number of issues, which social and cultural sciences should clarify and examine, to help society using natural science better and to help natural sciences become making better scientifically constructed knowledge available. A bit idealistic, I admit.

1. The topology of competing knowledge claims, their origins, their social power and their dynamics; natural science knowledge is one of these claims. Ideally it differs from others by its methodology of permanent skepticism and willingness to incorporate falsification. This includes the dynamics of what is named “skeptical climate science”.
2. Is scientifically constructed knowledge “better” than other explanation systems? In which respect “better”? A better guide to practical implementation or a system less likely to be falsified?
3. Empirical analysis to what extent climate science quarters are implementing the ideals of Merton’s CUDOS principles. Such an analysis needs studying specific cases – instead of broad general claims.
4. An Ethnology of the different tribes in climate science – how do they determine dominant narratives and knowledge systems, how are speakers chosen, how is the interaction with other tribes and stakeholders taking place?
5. Which expectation does the public and stakeholders have of the function, and possibly service, of climate science? Is this consistent with Robert Merton’s norms?
6. Are STS studies relevant for the practice of climate science and of science-stakeholder interaction, and are such studies taken into account by natural scientists?

This list can certainly be extended, and ordered better. A key element not explicitly included is the role of subjectivity of scientists. I have often heard very general assertions that all knowledge would be subjective, and thus there would be no qualitative difference between all of them; a kind of arbitrariness. While subjectivity is all over the place, and in that sense no objectivity would exist, we have to face that there is a “Wirklichkeit”, as the timing of the next high tide at the St Pauli gauge, which we can predict – and determine the skill of this forecast in an objective frequentist manner. Scientifically constructed knowledge has often superior utility.

But, this *subjectivity* – we natural scientists want to learn how it manifests itself, not in general terms but concretely, in our own work. My own answer includes two manifestations:

- 1) In the process of choosing issues for our scientific endeavor, we select topics, which are of interest for us. Understanding the chosen issue has more utility, and needs less efforts for us than other issues. Many scientists have entered the field of climate because they are concerned about the state of the environmental, some because they want to protect climate from human interferences.
- 2) In the process of accepting an explanation as valid, we employ alternative knowledge systems; when we “know” already that climate change is manifest in our environment, we need less evidence before accepting that man-made climate change is causing, for instance, an increase in Hamburg storm surge heights. On the other hand, we would ask for more evidence, if the data would not show the expected pattern of change. Our “backpack” of culturally constructed understanding guides us in the analysis, acts as an efficient filter when looking for consistent explanations.

In a sense, all this is “nice-to-have”, but does it matter? I believe so; I believe that better knowledge, more robust against falsification, will emerge in this way. My subjective assessment!

But there is one field, where it certainly matters, that is the practice of what is nowadays called “climate service”. In this practice, the idea is to make scientifically constructed knowledge “useful” in practical societal contexts - by providing options and perspectives valuable in societal and economic decision processes. This has something to do with the competition of knowledge claims, and it is by no means clear that scientific knowledge will be accepted as superior. An example is the smart physicist, who tells me that our storms are getting stronger because of the increased warmth of the air would lead to more water vapor and thus more kinetic energy. This sounds plausible but is easily falsified by the observation that our summers are warmer than our winters, even in the North Sea area, and that strong storms are an attribute of our cold season.

The issue of regional climate servicing was the latest topic Nico and I, plus 7 others, have written about in the *Journal for Environmental Law and Policy*.

#### **4. *Epilogue***

In retrospect, after 20 years of working with and learning from Nico Stehr, I see myself greatly enriched. He has opened various windows and doors to look or walk through, to approach relevant issues and exciting problems in other ways, with fresh ideas and different perspectives. Maybe, my own practice has converged toward his “social natural science” concept; in any case in my own lab we have now a few people with a social and cultural science background, and even in The Helmholtz Association of German Research Centers, the ideas is slowly spreading.

Nico, your presence and your teaching had a positive, useful effect, but maybe more important – it was fun working with you. Thanks, Nico.