

The Market of Climate Change Knowledge

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1. Knowledge about Climate Change

Science has established that processes of human origin are influencing the climate – that human beings are changing the global climate. Climate is the statistics of the weather. In almost all localities, at present and in the foreseeable future, the frequency distributions of the temperature continue to shift to higher values; sea level is rising; amounts of rainfall are changing. Some extremes such as heavy rainfall events will change. The driving force behind these alterations is above all the emission of greenhouse gases, in particular carbon dioxide and methane, into the atmosphere, where they interfere with the radiative balance of the Earth system.

This is the *scientific* construct of human-made climate change. It is widely supported within the relevant scientific communities, and has been comprehensively formulated particularly thanks to the collective and consensual efforts of the UNO climate council, the “IPCC.”

Of course, there is no complete consensus in the scientific community, so that speaking of “the scientific construct” is a simplification, which is applied in this essay for describing the contrast to the cultural construct, which is equally not just one construct but features many different variants. What is stated in the previous paragraph is the core of the consensus, and may therefore represent the core of “the” scientific construct.

What else do people know about climate and climate change? Here is what may be called social or cultural construct, which guides perceptions and understanding (cf. Stehr and von Storch, 1995). Climate really is changing because of human activity – due to deforestation, for example, as well (von Storch and Stehr, 2000). The weather is less reliable than it was before,

the seasons less regular, the storms more violent. Weather extremes are taking on catastrophic and previously unknown forms.

The cause? Human greed and stupidity. The mechanism: the justice, or the revenge, of a nature that is striking back. For large chunks of the population, at least in Central and Northern Europe, the mechanism is obvious. In old times, the adverse climatic developments were the just response to a God angered by human sins (e.g., Kershaw, 1973; Stehr and von Storch, 1995); this approach is also today, in particular in the US and possibly in the UK, sometimes invoked. An example is provided by the former Chair of the IPCC, Sir John Houghton, who expressed his conviction that God would speak to the public through disasters (Welch, 1995). Or, as it is put on the back cover of an alarmistic book “Our drowning world” (Milne, 1989): “...we shall be engulfed by the consequences of our greed and stupidity. Nearly two thirds of our world could disappear under polar ice cap water ... For this will be the inevitable outcome of industrialization, urbanization, overpopulation and the accompanying pollution.” An enlightened variant is suggested by Lovelock in the framework of his Gaia-hypothesis, when he speaks about “The revenge of Gaia - why Earth is fighting back ...” (Lovelock, 2006).

Finally, there was also the idea of “climatic determinism” (see Stehr and von Storch, 1999; Hulme, 2008), which can be traced back to classical Greek literature and was widely accepted in western thinking in the 18 century up to the middle of the 20th century. Some elements of this school of thought continue to have an effect upon our western culture. One of these elements is the understanding that human beings have to live in balance with that climate that is suitable for them. If this climate changes, civilisation is at risk; whole cultures perish on such an occasion – for instance, Native American cultures in North America, the Viking settlements in Greenland. No wonder, then, that in German usage, the term is *Klimakatastrophe*, “climate catastrophe,” and not “climate change.”

This is the *cultural* construct of climate change, particularly in the German-speaking countries, but similarly, and widely, in other areas of the West as well. It has to be stressed, again, that referring to just one well-defined construct is a simplification; obviously, the cultural construct takes many different forms; displays various nuances - but what is described above represents something like a standard core of such statements. Different perceptions prevail in, for instance, Germany and the United States of America (von Storch and Krauss, 2005).

Obviously, the scientific construct is hardly consistent with such cultural constructs.

These two constructs, scientific and cultural, are competitors in the interpretation of a complex environment; two protagonists on the market of knowledge. Their inconsistency makes them incompatible, but sometimes the two forms are nevertheless mended, the efficacy of the modernised construct so formed increases; its scientific basis, however, becomes narrower. Public acceptance rises; its robustness in the face of scientifically verifiable facts sinks; but its utility for pursuing certain value driven political agendas is improved; at the same time, science is corrupted. Of course, scientific practice – and thus its construction of explanations and theories – are influenced by the cultural construct in any case; because, after all, we simply cannot live free of our culture. Our culture conditions us in our point of view, steers us in our formulation of questions, in our willingness to regard answers as sufficient to build an argument. Needless to emphasize that there is no pure scientific construction in reality but at least a kind of approximation of such.

2. The Arena of Public Attention

In the 1970s the idea of *Bringschuld of science* was created in Germany – when related to science this term “Bringschuld” denotes the ethical obligation of scientists to pay their debt to society by informing it about existing, arising and possible future dangers. In the past, science had all too often turned a blind eye to such dangers, and instead made itself a willing servant of such scientific and technological developments as eugenics and nuclear power. Rewarded with financial incentives, recognition, and the satisfaction of a sometimes perverse curiosity, science looked on without lifting a finger and without taking responsibility. It was time to put an end to such inaction, the argument was. Scientists were to see their activities in a social context; to inform the public on their own initiative, without waiting to be asked – so that the public could then decide, democratically, what made sense and what did not.

What do we scientists – who may well be experts in their field, but who are otherwise laypeople like anyone else – know about the dangers at hand? It often happens that the perceived dangers lie outside the realm of our expertise; that is, we “experts” operate with culturally constructed knowledge – not, however, as the onlooking public believes, with scientifically constructed knowledge. Thus it is not the best knowledge that is put into action, but rather knowledge claims. Pretensions to interpretation, and to power, disguised as science.

It is not that there are few dangers, real or perceived; rather, there are many such dangers. They vie with one another in competition for public attention. The public, including us

scientists, is only able to “process” a limited number of topics at length; just how many is unclear, but it seems implausible to me that there would be at the same time more than ten or maybe twenty. Some of these topics are “givens,” such as the national soccer league, for instance. How are the topics that come to the fore chosen? One would hope that the deciding factor might be the urgency of the topic, the social or economic relevance, but that is most certainly not the case. Perhaps it is their entertainment value, even their fear-mongering value, the challenge they pose, or even, in terms of the interpretive order, their assurance that all is well with the cultural construct.

But of course one can attempt to “push” one’s own field of expertise into the arena of public attention. The attributes needed to accomplish this must then be added – by means of exaggeration, perhaps; by implicit associations; by exploiting the cultural construct, that is to say, what the public in any case recognises as being “correct.” “Waldsterben,” as a result of pollution, was certainly one such topic.

Whether fulfilling the terms of *Bringschuld* is beneficial or harmful for the individual certainly depends upon the social context. When everyone was enthusiastic about scientific and technological progress – when the German weekly “Micky Maus” comics, in the series “Our Friend, the Atom,” described a golden future of ubiquitous nuclear energy to their young readers – then no one paid any heed to the possible drawbacks of these advances. Today, however, with a sceptical attitude toward scientific and technological progress, particularly when it seems to be documented in our immediate environment in the form of masts, noises or smells, a scientifically presented assessment of the dangers is appreciated by society, particularly when such an assessment confirms prior knowledge and thus is recognised *a priori* as correct in any case. This appreciation can take a multitude of forms: a career, public attention and recognition, better working conditions, personal satisfaction in the belief that one has made the world a better place.

Satisfying the demands of *Bringschuld* is no longer an altruistic act nowadays, but rather a productive element in a marketing strategy. *Bringschuld* of science has led to a massive influx of proclaimed dangers into the arena of public attention. Environmental science, and not only environmental science, has become “postnormal.”

3. Postnormal Science Between the Requirements of Policy and the Media

The quality of being “postnormal” was introduced into the analysis of science by the philosophers Silvio Funtovitz and Jerry Ravetz (1985). In a situation where science cannot make concrete statements with high certainty, and in which the evidence of science is of considerable practical significance for formulating policies and decisions, then this science is impelled less and less by the pure “curiosity” that idealistic views glorify as the innermost driving force of science, and increasingly by the usefulness of the possible evidence for just such formulations of decisions and policy. It is no longer being scientific that is of central importance, nor the methodical quality, nor Popper’s dictum of falsification, nor Fleck’s idea of repairing outmoded systems of explanation (Fleck, 1980); instead, it is utility that carries the day. The saying “Nothing is as practical as a good theory,” refers to the ability to facilitate decisions and guide actions. Not correctness, nor objective falsifiability, occupies the foreground, but rather social acceptance.

In its postnormal phase, science thus lives on its claims, on its staging in the media, on its congruity with cultural constructions. These knowledge claims are raised not only by established scientists, but also by other, self-appointed experts, who frequently enough are bound to special interests, be they Exxon or Greenpeace.

Currently, climate research is postnormal (Bray and von Storch, 1999). The inherent uncertainties are enormous, since projections of the future are required, or rather: of futures – such futures that can only be represented using models, where conditions will prevail that no one has yet observed. We simply do not know exactly how the cloud cover will alter if temperatures and water vapour content change, or which will win the upper hand in terms of the balance of the Antarctic ice mass – increased precipitation in the heights, or melt-off at the edges. Our knowledge is inadequate not because the scientists are incapable, but rather due to the meagre facts available, the incomplete data, which moreover span too short a time period. Certainly there are arguments that point to one answer or the other, and considerations of plausibility allow us to exclude certain developments as unlikely or even impossible. There remains, however, a residual uncertainty that will possibly never be resolved, or will be reduced only in the course of years, or even decades. In this situation, the representatives of social interests seek out those knowledge claims that best support their own position. One need only recall the *Stern* report (see the critique by Pielke (2007) or Yohe and Tol (2008)),

or the regular press releases of US Senator Inhofe. Not only are those knowledge claims that seem suitable picked out and placed into a matching overall picture, however; new and idiosyncratic knowledge claims are also constructed, so that in the end, a bizarre accumulation of claims is produced – claims that sometimes seem arbitrary, such as that the number of patients with kidney stones will increase (Brikowski, et al., 2008), for instance, as a result of human-made global warming. The scientifically untenable film “The Day after Tomorrow” is praised by high-profile scientists as an aid to awareness-raising; political and scientific achievements are intermingled by awarding the Nobel Peace Prize simultaneously to Al Gore and the IPCC; politicians disguised as professors pronounce to the public necessary reactions to climate change. Along with these alarmist tendencies, there is also the sceptical counterpart, represented in such grossly misleading products as “State of Fear,” by the otherwise admirable Michael Crichton, or the film “The Great Swindle.” All of this is typical for a postnormal science.

In the daily course of events, there are many opportunities for both the individual and powerful scientific organisations to draw public attention to themselves. But there remains not only among natural scientists a gnawing sense that this practice simply cannot be that which we describe as more or less “good science,” where it is the argument, the critical enquiry, the well-constructed test, the unconventional idea that lies outside the prevailing paradigm, that effect progress, and not science’s usefulness for putting through a policy perceived or described as correct. What appears in *Science* and *Nature* is often prematurely published research; it stimulates the educated readership’s imagination, and sometimes its fears – and after a few years, it often proves to be in need of revision anyway. But this revision is ultimately the mechanism that extricates science from the whirling eddy of postnormality. When the caravan of public attention turns to other topics, then normal science takes hold again, and compromises with the required usefulness, the *Zeitgeist* and political correctness can be revised. On a smaller scale, we can already see this revision of details (but not the overall assessment) in the field of climate research: for instance, in the case of the so-called “hockey stick,” the premature closure of debate on the question of historical temperature fluctuations; or of the perception, pushed by some re-insurance companies, that the risk of storms has increased; or the perspectives that anthropogenic climate change would be associated with the break-down of the gulf stream or the desintegration of the West-Antarctic Ice Shield within decades. All popular claims for a while among media and activists, but oversold and now critically revised.

4. A Role for the Social and Cultural Sciences

For us, as scientists involved in this matter, the question is: how do we deal, here and now, with this postnormal situation; for we accept both demands – good science and good advice for the public – as justified. The solution can actually only be this: that we do what we do best, at least in principle, namely analyse the situation scientifically. But we natural scientists can do this only to a limited extent. We already suspect that the process of science is a social process; that we are not always quite objective, at least when we frame questions and accept explanations; that we are conditioned by our different cultures. That the advance of individuals into important positions often has less to do with science, and rather more to do with social and political acceptance.

In order to give our analysis depth and substance, we need the skills of the social and cultural sciences. My personal experience, which is admittedly limited, informs me that up to now, however, these sciences have largely kept their distance. What I have heard are occasional and general hints that everything would be socially constructed and relative – which I consider mostly signs of an unfortunate refusal to go into concrete detail, which would be unavoidable for any real synergy. It is disappointing when colleagues from these fields obviously fail to notice that the scientific and cultural constructs are falling away from each other; instead, they content themselves with cultural constructions as circulated by the popular media and vested interests.

Even if the overwhelming majority of social and cultural scientists, whom I came across in recent years, continue to close their minds to a transdisciplinary approach to the topic of human-made climate change, however, there are nonetheless outstanding successful examples of the required research collaboration with the social sciences. I refer to the exemplary work of the German media scholar Peter Weingart; and of the US-political scientist Roger Pielke, Jr.. There are others of similar or even greater caliber – but having found their work relevant for my practical task of communicating climate science with stakeholders, I will describe some of their work in the following paragraphs in some detail.

4.1. The Honest Broker of Knowledge

In his book “The Honest Broker,” Roger Pielke, Jr. (2007) has constructed a provisional typology of scientists. Further, he has described how politics degrades science to a theatre of

war by proxy, in order to solve problems that the political system itself cannot solve – no more than science can.

Pielke differentiates five types of scientists, who enter into communication with the public in various ways. The “pure scientist” is essentially driven by curiosity, and has hardly any interest in seeing his new scientific insights placed into a social or political context. The “scientific arbiter” enables an accurate understanding of indisputable scientific facts. Both types are well suited to those situations when a “normal” science can answer questions with great certainty, and these answers, if they come to be socially implemented, are as a rule uncontroversial.

But as I have just explained, at present climate research is not “normal,” but rather “postnormal.” As a result, we often see the “issue advocate,” who applies his scientific competence not to the impartial extension of knowledge, but rather to promoting a value-oriented, and thus also political, agenda. This means that the results of scientific insight are narrowed down to a few, or even to only one, “solution” consistent with his values. The last few decades in particular have produced many scientists of this type, who work and speak for economic or (socio-) political interests. The fourth type of scientist, and the one that Pielke clearly sees as a model to emulate, gives his book its name: “The Honest Broker.” This type distinguishes himself in that, unlike the “issue advocate,” he broadens the scope of the deductions he draws from his findings, rather than constricting it. Thus he enables the political process to choose the “solution” that society desires (and not that which is favoured and promoted by the issue advocate). The fifth type is the “stealth issue advocate,” who performs the functions of an “issue advocate,” but who cultivates the image of an arbiter or honest broker. Due to his fraudulent self-representation, in essence, he benefits neither science nor society.

Pielke recommends that science choose the path of the “honest broker,” who explains the complexity of the problems and contributes to weighing up the implications of possible decisions. In doing so, he puts society in a position to choose solutions for its controversies, even on the basis of uncertain knowledge regarding the connections and possibilities, but rationally, and in a manner consistent with its values – for instance, in order to deal with the prospect of climate change that society itself has caused.

The other question is that of the proxy battlefield. Again and again, we see situations in which politicians run aground, coming to decisions that are perceived negatively by significantly large or influential groups. In this case, it happens that a factual constraint is

built up, so that policy-makers, in accordance with the scientific analysis, purportedly can come to only one decision. Politics then portrays itself as subordinate to science. This is the case particularly in the field of climate policy, where the “two-degree goal” for avoiding catastrophic climate change, as formulated by scientists, is depicted as an *ultima ratio* to which policy-makers simply must yield. In accordance with the insight that nothing is as practical as a good theory, because it guides the action to be taken, this depiction is indeed extremely useful politically, precisely because it does indeed guide the action to be taken. Further discussions are not required; the goals of climate policy will be met by means of energy policy, the concept informs. The problem is, however, that the confrontation has been transferred from the visible political stage to the less visible scientific discussion. In that realm, just as little consensus has been reached among scientists as among the politicians, and the resulting argumentative conflict among the scientists degenerates into a political confrontation, fought according to the rules of politics, and ultimately “won” by one party or another.

This process is useful to policy-makers – after all, they come to their decisions more easily – but science is done an injury by thus being politicised. This is not a sustainable use of the resource we call “science,” whose service to society by rendering an interpretation of complex facts is ultimately barely distinguished, in the public perception, from the political information disseminated by interest groups.

From this, Pielke derives two normative demands: namely, that the responsible scientist should act as an “honest broker,” and that policy-makers should concentrate on posing only scientifically solvable problems for science, but not on evading their own responsibility – to find a “solution” consistent with society’s values in normatively difficult situations.

4.2. Risks of Communication

In a book published in 2002, Peter Weingart and his colleagues (2002a, 2002b) have reconstructed how the topic of climate moved from science to the realm of politics and the media in Germany.

Initially, within scientific circles there was a phase of “anthropogenisation and politicisation,” according to which human beings were to blame for climate change in the first place, and they could also guide and manage this change by means of responsible behaviour. Those responsible, those affected and the options for action were clearly named. Thus, as it was put in the 1986 declaration by the Energy Study Group of the German Physical Society:

“in order to avert the threatened climate catastrophe, we must now begin drastically to reduce the emission of trace gases.”

This description quickly found its way into the political discussion, because it was also suited to a broader environmental policy discourse. Thus, the concept of catastrophe, once brought into the world, was taken up into the political language. At the same time, the “climate catastrophe” and the struggle to avert it came to be understood and described as an object of policy-based regulation.

The topic was picked up by the mass media, resulting in a further dramatisation and intensification. Here, Weingart describes the elements of the “manufacture of climate change as an event,” “the staging of the relevance of climate change for day-to-day life,” and finally the transformation of the scientific hypothesis into the “certainty of the coming catastrophe.”

Peter Weingart substantiates all of these steps by means of examples. Then he poses the question of the risks involved for the three actors: science, politics and media.

For science, the principal risk is the “loss of credibility due to the particular dynamic of the catastrophe metaphor.” This concept enabled climate research to enter onto the stage of politics and the media, but due to its parallel cultural construct this communication also smuggled along with it a number of connotations. Science is now confronted with these connotations, in statements such as: You made this claim and that claim, how does that match up with this current development, or that one? Klaus Hasselmann analysed this phenomenon in his response, “The Moods of the Media,” (Hasselmann, 1997) and lamented that the evidence science was presenting would first undergo a metamorphosis, and science would then have to let itself be measured by these now altered messages. This certainly is not fair, but it is political and social reality. Or, as a journalist once said to me: “Whoever hitches a ride upwards with the media, will meet them again when going down.” In both cases, the elevators function according to the same rules.

The risk for policy-makers is in the possibility that the goals set in this manner cannot be achieved. Weingart speaks of a “loss of legitimacy due to taking on too much.” That Kyoto was unable to prevent the perceived “climate catastrophe” was foreseeable from the outset; that focussing one-sidedly on energy policy was indeed useful in staging the event for the public, but did not do justice to the facts of the matter.

The media primarily fear the “loss of public attention,” due to concepts and conceptual fields becoming worn out. In 2005, when it was declared that there remained only 13 years

more in which the climate could be rescued (McCarthy, 2005), and in the following years very little happened, other than rhetoric and symbolic acts on both the scientific and the political side, then the media, for their part, attempted to gain the public's attention by other means; for example, by propagating a sceptical counter-discourse (SPIEGEL, 2007) This is exactly what we observe in the last few years. This counter-discourse, staged by the media, follows the logic of Hasselmann's "Moods of the Media," but also corresponds to the attempt within scientific circles to limit the acceptance of the misleading cultural construct in favour of the more realistic scientific construct. Weingart and his collaborators describe this as follows: "The object and trigger of this [climatic] scepticism are, not least, the correcting and relativising of scientific climate scenarios by established climate research itself. In the sciences this is a normal process; in the media, it becomes an incentive to mistrust."

Science, or more precisely: the scientific institutions react to this risk by implementing professional "press relations" – which are oriented to "representational principles of the mass media." Policy-makers protect themselves by creating a "hierarchy of knowledge, or of advice," with advisors to the Chancellor, Climate Service Centres and the like. The mass media seek the attention of the public by selectively presenting scientific findings that either agree or conflict with the cultural construct, or else by staging controversies, by which means yet another cultural construct is served; namely, the construct of the allegedly arbitrary nature of scientific evidence.

5. Challenge to Scientific Institutions

Most scientific institutions around the world, dealing with climate research, are confronted with requests by the public, decisionmakers and the media for understanding the "climate problem", and options available for "action". The heads of these institutes travel throughout the country, talking to the media, the public and, sometimes, to politicians.

This is also so in my own institution, the Institute for Coastal Research of the GKSS, which sees itself faced with a demand for advice, above all from the realm of coastal protection, but also those of marine traffic, tourism and other sectors. Just as important is the demand for interpretation on the part of the public, particularly in the form of the media, regarding climate change and the classification of conspicuous events, above all storms and storm surges. In other institutions, the situation is similar. We have developed a strategy to deal with these needs, foremost at the regional and sectorial level. At first, this process was conducted *ad hoc*.

Since then, we have attempted to structure the task more broadly, and approach it more systematically. We believe that our approach may also be useful for other institutions in other cultures.

The elements of this approach are (von Storch and Meinke, 2008):

- 1) A systematic consideration of the significance of adapting to climate change and the possibilities of mitigating climate change; for instance, in the form of the 10-point “Zeppelin Manifesto,” by Stehr and von Storch (2009; see also in German <http://www.spiegel.de/wissenschaft/natur/0,1518,576032-11,00.html>). Apart of the obvious options, such as enlarging the rainwater system, or hightening dykes along rivers and coast, conceptually different and intriguing options emerge upon closer scrutiny – such as re-designing urban planning (Gill et al., 2007) to deal with the effects of heat waves or geo-engineering estuaries (von Storch et al., 2008) to reduce the hazards of storm surges.
- 2) A survey of the scientifically legitimate knowledge claims regarding present and future climate change in relevant regions. “Scientifically legitimate,” in this context, refers to publications by recognised scientific institutions, corresponding to current good scientific practice. This is not a matter of representing the “best knowledge,” which is often a problematic claim in any case, but rather of identifying a consensus, including the consensual determination of those areas where there is as yet simply no consensus. A consensus of disagreement (BACC, 2008; Reckermann et al., 2008).
- 3) The availability of descriptions of regional climate changes in the recent past, detailed in terms of time and place. For Northern Europe, such a data set is CoastDat (<http://www.coastdat.de/>), which covers the period from 1948 to today. In addition to other common-sense applications (Weisse et al., 2009), such a data set allows us to assess to what extent current changes can be seen as consistent with the changes indicated to us by climate models, in the form of scenarios (e.g., Bhend and von Storch, 2009). This helps to overcome a frequent and highly counterproductive element in public communications: the fondness for frequent – and negligent – assertions that this or that event is a harbinger of what is in store for us. As a rule, there is hardly a basis for such claims. Data sets of climate variability and weather extremes of the past decades allow deconstructing such claims. (An example for the case of US landfalling hurricanes is provided by Pielke et al. (2008); for Northern European storms, Weisse et al (2005).)

- 4) This catalogue of the knowledge on offer is rounded out by a knowledge broker, a regional climate office. Within the framework of the Helmholtz Association, we have set up four such regional climate offices in Germany (<http://www.klimabuero.de/>). The fundamental idea of the regional climate offices is based on the observation that communication about the climate is not a question of “Knowledge speaks to power,” or the coaching of an uneducated public, as many naive physicists and meteorologists still like to believe. This challenge cannot be met with a pedagogically inspired website, or a climate game. Rather, the primary necessity on the part of science is to understand what exactly the questions from the public and the policy-makers entail. How these questions are connected to other complexes. Whether the answers given by climate research have any bearing at all on these questions. To what extent our ideas are in competition with cultural constructs.

The North German Climate Office at the GKSS, which is managed in tandem with the Hamburg Centre of Excellence for climate research, CLISAP, is thus designed with bilateral communication in mind.

6. Concluding Remarks

This article is a personal account of a climate scientist, who is often engaged with the need of communicating with stakeholders and with the media, mainly in Germany. During this communication I was confronted with a number of problems, which obviously are not specific for my own practice, but which I found to be similar with that other natural scientists.

The key element of my summary is the insight that we have two competing knowledge claims, or, to formulate more precisely, two classes of knowledge claims. For cultural scientists this is no surprise, but for many natural scientists, this statement is almost an affront.

Scientific knowledge, in social practice, is only one form of knowledge; it must compete with other forms, and it will not automatically “win this competition”– or maybe better: “be accepted as superior knowlegde”. What would be the “best” outcome of such an encounter? – “best” in the sense of instituting the most rational available understanding of phenomena and their dynamics. It does not imply the availability of immediate practical advice for designing policies, but the presentation of a solid basis of the natural science issues of such policies. A separation of science and values, to the extent possible. If this goes along with

nudging of cultural constructions towards the scientific construction, a gradual rationalisation, that would also be a favourable cultural result – for me.

The outlook of this discussion is related to my unfortunate limitation of drawing mostly on Central and Northern European experience. Plausibly, in other cultures, say in Asia or Africa, different attitudes and constructions will prevail and compete with scientific views. This may be in particular so in the US and China. We need urgently cultural scientists and scientific platforms, which bring the natural and cultural approaches together.

If scientific actors do not recognise this dynamic, they often attempt to “optimise” the dissemination of their “message” by means of propagandistic tricks – such as emphasising, or selectively communicating, information to suit its purposes. As a result, first, the public will be disenfranchised; and second, science, as a socially accepted institution, will be damaged. I consider it our task to pursue science on a sustainable basis.

The insight of two competing types of knowledge has a number of practical implications for science. One is, that science itself is under permanent influence of non-scientific knowledge claims, such as ideological or pre-scientific claims. They influence the scientist in his way of asking and in her request for evidence before accepting answers. Claims, which are consistent with cultural constructed knowledge are easier accepted as accurate than results, which contradict such claims. Another issue is the transfer of scientific understanding into the policy process. Here, the scientific understanding should help to prepare policy design – which must not be misunderstood as enforcing certain designs – by clarifying the natural science part of the issues.

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