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Inexact science

Climate policy between experts and politicians

Climate policy is heavily dependent on expert scientific opinion, with the IPCC the leading authority. Yet uncertainty surrounds the science of climate change, and in particular the 2° target. Does politics' reliance on inexact science disqualify its decisions? And does scientists' involvement in politics prejudice their objectivity? Not necessarily, writes Åsa Knaggård.

The role of experts in democratic society has periodically been the subject of energetic discussions, both in academia and in politics. In the 1960s and 1970s, some cautioned that scientific experts would take over politics and shelve ideology in favour of rational, problem-solving mechanisms. Others, meanwhile, hoped that exactly this would happen. Since then the debate about experts and democracy has abated.

However there are now reasons for revisiting the debate in light of the authority wielded by experts in issues related to environment, health and technology. Many of the environmental problems we face today would be unknown were it not for scientific experts. The connection between skin cancer and the thinning ozone layer belongs to this category, for example, as does the fact that global warming is caused by the burning of fossil fuels. In issues of climate change, experts have an important role in setting the political agenda.

A renewed discussion about experts in democracy should, then, focus their role in the policy-making process and the extent to which politicians follows the advice of scientific experts. The discussion must be based on knowledge of how experts actually affect political decision-making. The traditional notion of the relationship between knowledge and decision-making holds that it is possible to clearly differentiate between facts and values. Facts belong to the world of science while values belong to the political sphere. The role of the expert is to act as a facilitator between the two worlds.

The view has strong support in both science and politics, despite studies showing that a dichotomy between the neutral and objective scientist on one hand and the value- and interest-oriented politician on the other does not represent reality.¹ While the traditional view influences experts' and politicians' understanding of their roles, it cannot fully explain the relation between them.

Climate change as a political issue

The process of climate change is not possible to detect without the help of experts. Even if we have the impression that summers are becoming warmer, that there is less snowfall in winter and that storms are getting heavier, we

would not be able to connect these phenomena to our greenhouse gas emissions. It should be possible for experts, then, to have a significant influence on politics, both by defining climate change as a problem and by formulating solutions.

However, as a political issue, climate change is not only connected to matters of fact, but also to matters of value. Who benefits and who loses out from climate change — and climate policy — are essentially political questions about the allocation of resources and risks in society. The economic gravity of the issue has contributed to the disparate views of the costs associated with it. Some see these in connection with reducing greenhouse gas emissions,² others in connection with climate change itself.³

The issue of climate change is indeed highly complex; even the experts have difficulties grasping it completely. One needs to understand not just how natural systems like air, water and soil interact with one another, but also how they interact with social systems. Despite a significant increase in knowledge about how climate works and how it is affected by our emissions since the first report of the Intergovernmental Panel on Climate Change (IPCC) in 1990, considerable scientific uncertainties still exist, for example how sensitive the climate is to a higher concentration of greenhouse gases in the atmosphere.

Climate change surfaced as a political issue in the late 1980s through a series of international conferences with participation from both academia and politics. This period saw the formation of the IPCC and the preparation of an international climate convention that was later signed at the Rio Earth Summit in 1992. The climate issue surfaced in Sweden in 1988, when the conservatives won support in the Swedish Parliament for a motion on limiting CO₂ emissions, thereby forcing the issue onto the political agenda.⁴

One major problem in climate politics is the temporal aspect. Because of the time it takes for greenhouse gases to break down in the atmosphere, the full consequences of our greenhouse gas emissions, both past and present, will not be known for centuries. Furthermore, the inertia inherent in climate and earth systems causes them to react slowly to increased concentration levels. The role of experts in elucidating what the consequences could be, and when they will be felt, is very significant.

In tandem with the long-term perspective, a short-term plan is needed — action is required *today* to mitigate future effects on the climate. However, the short-term plan does not require advice from experts to the same extent as the long-term perspective, since it is based to a greater degree on what is politically *possible*. It is necessary for policies to have both a long-term and a short-term perspective, and the conditions for these differ.

The long-term perspective was established in the UN Framework Convention on Climate Change, which states that we should prevent "dangerous anthropogenic interference with the climate system".⁵ Yet in order to establish a level of "dangerous interference", one first needs to be able to know of the effects of interference — flooding for example. After that it is necessary to determine a level of global warming that would not have these effects: whether it is a one, two or three degrees increase in global temperature. The concentration of atmospheric greenhouse gas that corresponds to this "dangerous" level then needs to be ascertained: the consensus, in Europe at least, is that it is more than twice pre-industrial levels. There are several steps in establishing a dangerous level, and all are fraught with uncertainties. Indeed,

numerous scientists researching what dangerous anthropogenic interference with the climate system could be have declined to prescribe specific levels.⁶

Political values and scientific uncertainties

The problem for scientists is that what is considered "dangerous" is an estimate, since it is decided by what we find acceptable, something that varies between people and situations. Many scientists, the IPCC included, have therefore argued that the "dangerous" level should be decided politically. Science can study the consequences of global warming, and the temperature increase that causes these to occur, but it cannot decide what the "dangerous" level is. Here, scientists are following the traditional view of the relationship between science and politics, with its sharp dichotomy between facts and values.

The problem for politics is the complexity in establishing "dangerous" levels. Not only does it involve the steps above, but also the question whether we can protect ourselves from the dangerous effects of global warming by, for example, prohibiting construction in coastal regions in danger of being inundated by rising sea levels. The complex nature of the subject and uncertainties in predicting long-term climate development means politicians find it problematic deciding what a "dangerous" level might be. First, one can only speculate about how interests will change — people living a hundred years from now might have different priorities than us. Second, it is not certain how to best serve the interests of coming generations. Uncertainties concerning interests and how to serve them make it difficult to establish a course of political action.

How do we solve this dilemma? One can argue that it is the job of the expert to translate scientific knowledge into knowledge relevant to politics — in this case, defining the level of dangerous anthropogenic interference with the climate system. But who are these experts? The IPCC is viewed as the most prominent expert in the field. Instead of conducting research of its own, it compiles and evaluates climate research, with hundreds of scientists from around the world contributing to its reports. What distinguishes the IPCC from a purely scientific forum is the fact that the summaries of its reports are politically negotiated before being published. This does not imply that the scientific conclusions are modified, but that the wording of these conclusions is politically negotiable. Nevertheless, the IPCC does not take a political stance on climate change. This attempt to differentiate between being politically relevant and holding a political opinion is not without its problems, as we shall see.⁷

There are, however, others who have taken it upon themselves to act as mediators. Back in 1990, the Stockholm Environment Institute (SEI) published a report warning of the risks related to global warming at a level higher than 2° Celsius above pre-industrial levels.⁸ At an early stage, the Swedish Minister of Energy, Olof Johansson, argued that the 2° target should be accepted as the long-term climate policy goal. He based this on a report from the Swedish Environmental Protection Agency,⁹ which in turn had referred to the SEI report.

A 1996 report of the European Union's Council of Ministers expressed its support for the 2° target (this was, however, unrelated to Johansson's proposal). However, after the ratification of the Kyoto Protocol in 1997, the EU's focus was on the national emission reductions prescribed by the protocol. In recent

years, the 2° target has received renewed attention and been repeated by the Council of Ministers. According to Richard Tol, a scientist sceptical of the target, it is based on a small number of unrepresentative scientific reports. In his view, most scientists acknowledge that the uncertainties are too large to set such a target with any confidence.¹⁰ Moreover, the EU is unable to fulfil the target by itself, since it is global in character. That the reports are not representative directly translates into unwillingness from the scientific community to shoulder responsibility.

This clearly demonstrates the problem with experts in democratic systems: those questions to which politicians need answers, scientists either lack the capacity or are unwilling to answer. The result is that those who do take it upon themselves to act as experts have far greater influence than they would do had more scientists participated in the political discussion. Furthermore, the argumentation of those experts is easily discredited by dismissing them as non-representative, much like Tol does. This makes it even harder for politicians to decide whether to listen to the experts or not.

What further complicates the use of the 2° target is the fact that the atmospheric concentration of greenhouse gases that corresponds to the target is unknown. This knowledge is needed in order to steer towards the target, since the concentration forms the basis for calculations of emission reductions. The proposed concentration levels for carbon dioxide have varied over the years from 400 parts-per-million to 550 parts-per-million. It has recently been asserted that a CO₂ concentration of only 350 parts-per-million is required in order to reach the 2° target.¹¹ The reason for these uncertainties is that we do not yet fully know how sensitive the climate system is to increases in concentration levels. Some scientists are of the opinion that the climate is sensitive, leading them to advocate lower concentration levels, while others consider the climate to be fairly resilient, and advocate higher levels. In general, the lower levels have come to dominate the debate.

From a political perspective, not being able to get answers regarding a level to steer towards in order to reach the 2° target is frustrating. Yet it also introduces flexibility. As knowledge about the climate system matures it will be possible to modify the targeted concentration level to one regarded as both scientifically and politically reasonable, without being forced to change the temperature goal. Deciding the concentration level to some extent becomes secondary; it is the temperature goal that is the symbol of long-term climate policy.

2° as a boundary object

The 2° target is a long-term target formulated nearly twenty years ago, in a scientific field that has seen rapid change. Still, the 2° target has shown itself to be something of a political survivor, despite the questions it leaves open: What are the consequences for climate policy when one limits global warming to 2°? Do we prevent dangerous human-made effects by limiting global warming to 2°? In order to understand why the target has become established, it is necessary to introduce the term "boundary object".¹² Boundary objects, which can be things, humans, texts or ideas, straddle different social worlds, for example science and politics; they make it possible for these two worlds to use a concept, each in their own way, while at the same time using it to create common ground between them.

The 2° target can be viewed as such a boundary object between science and politics; it facilitates collaboration, while at the same time allowing different

understandings in politics and science respectively. Scientists can examine probable changes in nature caused by various levels of global warming, including 2° Celsius,¹³ thereby avoiding the risk of tainting their scientific objectivity and credibility with political values. Politics can use the 2° target as a symbol for long-term climate policy, despite the scientific uncertainties associated with it. In an otherwise complex issue the temperature target is something everyone can understand. As a long-term target it can also moderate ideological differences: without compromising the target, different political parties can choose different strategies for reaching it. Politicians can use science to legitimize their policies without running the risk that scientists will take over politics.

According to the traditional view, the legitimacy of a political decision derives, among other things, from its being based on "truths" provided by the scientist. The 2° target is not a truth in this sense, but rather an estimate of what can be considered dangerous. Here we see the creation of a democratic dilemma. The 2° target gains legitimacy when politicians and scientists refer to the IPCC. Regardless of whether politicians are aware of it,¹⁴ the effect is that the IPCC shoulders responsibility for validity of the 2° target, even though it has been formulated by other experts.

From a traditional democratic point of view, it can be seen as problematic that the target "belongs" to the scientific domain. There is the danger that the issue, though charged with values and clearly dealing with questions of allocation, is seen as fact-based and thus not open to political debate. If, on the other hand, we understand the 2° target as a boundary object between science and politics, the critique that the target is not based on neutral scientific knowledge suddenly is not so relevant — it has been created as an interplay between science and politics, where there are no clearly drawn lines between facts and values. Instead, what is essential is that the 2° target simplifies political decision-making while retaining scientific integrity. The democratic problem concerning insufficient political debate remains, however. While 2° as a boundary object enables a dialogue between science and politics, it will not lead to a public debate.

What are the implications of this boundary object for the expert? The boundary object makes it easier for the scientist to shoulder the role of expert, enabling cooperation with politics without sacrificing scientific integrity. A potential problem could be the loss of scientific credibility of the IPCC as a result of having the target ascribed to it. Because of the influence still wielded by the traditional view of the relationship between science and politics, attempts by the IPCC to position itself as a neutral expert could fail if the public and the scientific community are led to believe that the IPCC has an opinion about the target. The 2° target as a boundary object also demonstrates the importance of the role of the civil servant in the translation of scientific knowledge into politically relevant knowledge. In Swedish climate policy, it is clear that state agencies have an important role as interpreters of 2° as boundary object. It is the civil servant, rather than the scientist, who will communicate the meaning of 2° as a political target.

The Swedish Environmental Protection Agency was fully aware of the vagueness and uncertainties of the 2° target; it also knew that it was based on a report of the SEI, and not the IPCC. However, in the Ministry of the Environment, where there was much less knowledge about the uncertainties of the target, it was ascribed to the IPCC. This means that officials at the Swedish Environmental Protection Agency, collecting and adapting knowledge, to a

large extent interpret the vagueness of the boundary object.¹⁵ They are aware of the problems related to the 2° target and can clearly describe these in their reports. The fact that acknowledgement of the scientifically uncertain status of the 2° target disappears somewhere between public agencies and ministries need not imply that civil servants knowingly omitted this in their reporting. It could well be that this knowledge was not judged to be politically relevant.

Finally, what are the implications of boundary objects for politics? We have already discussed the leeway inherent in the 2° target when seen as a boundary object. The target has a politically cohesive function and acts as a symbol of long-term climate policy; the fact that knowledge basis for the target is less than rock solid is of secondary importance. Deriving legitimacy from the IPCC is less problematic for politics than for science. Even if the target *per se* does not originate from the IPCC, knowledge about the environmental and societal consequences of the 2° target, as well as the concentration levels that corresponds to it, is based on IPCC reports. By utilizing 2° as a boundary object, expert scientific knowledge can be made understandable in a political context.

However, one should bear in mind that the long-term target is only one aspect of climate policy. Short-term action is more politically motivated. In many cases, reducing emissions is based not on long-term targets but on what is politically possible. Depending whether the focus is on what nature can absorb, or on what is politically possible, the degree of expert influence on the political process will vary. Despite the EU's adoption of 2° as the long-term target, the process tends to be dominated by concerns over what is politically possible. The extensive efforts of scientists to increase public knowledge of climate change, and the equally extensive efforts by experts to translate this knowledge into politically relevant knowledge, has played a significant role in some aspects of climate policy. Other aspects, however, have tended to be dominated by political interests.

¹ Studies in the field of Science and Technology Studies (STS) have shown that research as a process is neither neutral nor apolitical. See: Sheila Jasanoff et al. (eds.), *Handbook of science and technology studies* (1995); Bruno Latour and Steve Woolgar, *Laboratory life* (1979); and Bruno Latour, *Science in action* (1987).

² Economists subscribe to this view argue that while the greater share of the effects of climate change are expected in the future, we have to bear the financial cost today. Through discounting, i.e. calculating the value of the future costs today, the costs in the near future are valued higher than those in the more distant future.

³ For example Nicholas Stern, *The Economics of Climate Change: The Stern Review*, 2006.

⁴ See: Åsa Knaggård, *Scientific uncertainty in the policy process. A study of Swedish climate change policy*. Lund University, 2009.

⁵ The objective of the convention is the "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system", United Nations Framework Convention on Climate Change, 1992, article 2.

⁶ See for example Hans Joachim Schellnhuber et al. (eds.), *Avoiding dangerous climate change* (2006).

⁷ For a more thorough discussion on the IPCC, see e.g. Shardul Agrawala, "Structural and process history of the Intergovernmental Panel on Climate Change", in *Climate Change*, no. 39, 1998, 621–642.

⁸ F.R. Rijsberman and R.J. Swart (eds.), *Targets and indicators of climatic change*, 1990. Some see the influence of the SEI report as modest, for example Shardul Agrawala, "Early science-policy interactions in climate change", in *Global Environment Change*, no. 9 1999, 1996.

⁹ Swedish Environmental Protection Agency, *Åtgärder mot klimatförändringar*, 1992, 42–44.

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Richard Tol, "Europe's long-term climate target", in *Energy Policy*, no. 35 (2007), 209–222.

- ¹¹ James Hansen et al., *Target atmospheric CO₂: Where should humanity aim?*, 2008. This is actually a level that is lower than the concentration level today. In carbon dioxide equivalents it corresponds to something like 400 ppm.
- ¹² The concept was introduced by Susan Leigh and James Griesmer, "Institutional ecology, 'translation' and boundary objects: Amateurs and professionals in Berkeley's Museum of Vertebrate Zoology", in *Social Studies of Science*, no. 19 (1989), 387–420. Cf. the concept "boundary work" discussed by Thomas Gieryn in, "Boundary work and the demarcation of science from non-science", in *American Sociological Review*, vol. 48, no. 6 (1983), 781–795. The concept implies that the boundary between science and non-science is not given but depends on "boundary work" by scientists, aiming at defining science as compared to non-science. According to Simon Shackley and Brian Wynne, a "boundary object" is a result of "boundary work"; see: "Representing uncertainty in global climate change science and policy", in *Science, Technology & Human Values*, no. 21 (1996), 280.
- ¹³ IPCC, among others, has used this method. See: IPCC, *Climate change 2001: Impacts, adaptation, and vulnerability* (2001), 5; IPCC, *Climate change 2007: Impacts, adaptation, and vulnerability*, 2007, 15–16.
- ¹⁴ One reason for politicians stating that policies only follow science is that it facilitates the diversion of criticism. See Shackley and Wynne, 1996, 283.
- ¹⁵ Cf. Simon Shackley and Brian Wynne, "Global warming potentials: Ambiguity or precision as an aid to policy?", in *Climate Research*, no. 8 (1997), 98.

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