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The ethos of scientific advice: a pragmatist approach to uncertainty and ignorance in science and public policy

Arthur C. Petersen

Hans Radder has written on the ethos of academic science, in the context of his analysis of Mertonian values and scientific norms in academic research (Radder 2010). Radder was interested in particular to evaluate what his "deflationary, neo-Mertonian approach" (Radder 2010, 214) implied for the practices of patenting of academic research. In this essay,[1] my aim is to follow a similarly normative approach to the ethos of scientific advice in public policy, by arguing for particular values that should be upheld in responsible scientific advising—values that can be regarded as an extension of the Mertonian values for academic research (universalism, communism, disinterestedness, and organized skepticism).

In this essay, I derive some values for scientific advice from a set of guiding principles that I developed earlier and proceed with a philosophical underpinning of these values in philosophical pragmatism. All this is done while thinking about solutions to the public policy problems of climate change and sustainable development.

The problem of climate change and its potential solutions

Today, there is great uncertainty about the future of the planet (see, e.g., Petersen [2011] 2012). For one thing, we still know too little about how the Earth works as a system. We are dealing with an extremely complex natural system, and one which we shall probably never completely understand. This applies at all levels of scale, from the local to the global. We *do* know that we have entered the "Anthropocene," an era in which mankind itself has become a significant geological factor, with human activities

1 This essay is based in part on the author's notes for a public lecture "Down to Earth: Wenkende perspectieven op verduurzaming vanuit het filosofisch pragmatisme", given in the University Hall of Utrecht University on 30 October 2012.

having a major impact on the Earth's ecosystems. The large-scale changes to "system Earth" can create new opportunities as well as new risks. Both the opportunities and the risks are subject to uncertainties. Not only are we ignorant about how the natural systems work, we do not know nearly enough about how society itself works at any level of scale. Furthermore, the measures proposed in response to the risks created by system changes will themselves have uncertain effects. One of the main the problems in governing the Earth system is how to mitigate and adapt to climate change. The challenge that lies ahead here is how innovation in the world's energy system can be organized so that new technologies are developed in a responsible way. Innovations in renewable energy will help towards climate-change mitigation, as well as sustainable development.

If one wishes to accelerate the transition to renewable energy—which has already started but is not yet taking off—then the price associated with emitting carbon must be high enough and stable, and governments must invest in innovation for renewable energy technology and engineering. Societies will then be able to move faster and better equipped in the direction of a system of energy supply that is sustainable. Policies for reducing carbon emissions are most efficient and effective when they are both set at the international level and directly affecting citizens and companies; the role of national governments should then be limited to facilitating the implementation.

One must be realistic, however, about what can be expected from actors at the different levels—international, national and local. For instance, internationally, the United Nations negotiations do not seem to be able to deliver sufficient results for now, even though countries have agreed on a global policy target of a maximum warming of two degrees Centigrade above preindustrial temperatures. Given present economic interests and their lobbying power it turns out politically to be very difficult to reach global agreements on emissions reductions that would suffice to reach this target. An alternative approach for reaching deep emissions reductions could be for governments not to try to tackle emissions directly, since it is very difficult for national governments in countries with open economies to directly influence emissions. Instead, a small group of big emitters (including the US and China) could make agreements on things that they can steer, for instance energy efficiency, energy technologies and emissions trading systems. A UN system that is able to steer carbon emissions at a global level is likely to be several decades away from us (say, the middle of the 21st century).

But what would then be the relationship between national governments (and, in the Dutch case, the European Union, as a relevant level between the local and global), on the one hand, and citizens and companies, on the other hand, given that one adjust one's expectations, as pleaded for in the above? Maarten Hajer (2011) pro-

poses a radical shift in governments' governance philosophies. Governments now make too little use of the creativity and learning capabilities of citizens and companies in the "energetic" society. Besides there being an obvious role for governments (for EU countries especially at the EU level) in stimulating a broad portfolio of technology development, governments should now start to address the "soft," institutional side of the problem: governments should remove obstacles so that citizens and companies are stimulated to create new markets for the newly developed technologies. This new role for governments does not imply that governments should abandon their regulatory roles. In the context of renewable energy technology, governments should especially regulate the risks associated with new technological developments.

Dealing with uncertainty and ignorance in scientific advice

Given the uncertainties surrounding climate change and technological innovation, questions are raised for society about acting under conditions of uncertainty and ignorance. More generally, over the past decades a number of complex policy problems involving uncertain scientific information and ignorance have arisen that have led to a reconceptualization of the relationship between science and public policy.

One can make reference here to a couple of literatures in science and technology studies (taken broadly) on this topic here. Scientists can be found working together with nonscientists, civil servants, policy makers, and other stakeholders in hybrid forums (Callon et al. 2009) such as task forces or assessment teams. Scientists and other actors then co-produce "serviceable truths" (Jasanoff 1990), that is, translate scientific work into concrete recommendations applicable to concrete problem contexts. Such practices have been variously labeled as "co-production" of epistemic and social order (Jasanoff 2004), "boundary work" (Guston 2001), "mode 2 science" (Gibbons et al. 1993) and "post-normal science" (Funtowicz and Ravetz 1993; Petersen et al. 2011). These practices do not need to result in consensus. When diverse stakeholders engage in controversies on a particular issue, they articulate the stakes around that issue within different framings. Controversy can be regarded constructively as an informal form of technology assessment (Rip 1986). Policy-makers can also plan for information-gathering on emerging technologies and adaptation of policies on the basis of new information and further evolution of controversies (Petersen 2008; McCray et al. 2010).

In my inaugural address at the VU University (Petersen 2011 [2012]), I presented an analysis of the role of scientific advisers towards public policy. Given all

the uncertainties surrounding the future of the Earth system, what role can and should scientific advisers play in the societal debate about its governance? When a scientist is called upon to advise governments or to take part in public debates, s/he bears a great responsibility to perform the task well. Roger Pielke (2007) identified four roles: "pure scientist" (not interested in the practical implications of his/her research); "science arbiter" (will confine himself/herself to advising on those issues which can be incontrovertibly resolved by science); "issue advocate" (attempts to promote a particular interest by virtue of his/her status as an expert, while not revealing his/her own values or preferences); and "honest broker of policy alternatives" (assess and communicate uncertainty and analyze the different values and perspectives on the problem). In my inaugural address I added a fifth role to Pielke's four:

> I would like to propose a fifth role for scientists. It can be seen as an extension of the role of "honest broker of policy alternatives" but has a somewhat broader scope. This role entails revealing and explaining precisely what the scientific field is doing. It entails providing transparency with regard to the questions raised, and it entails reflection on the science system itself. I therefore term this role the "reflector." The reflector will reflect upon how research themes are defined; he will reveal and explain the underlying value patterns. The reflector attempts to stand above the process of interaction between the physical world and policy. He is not concerned with the possible answers to policy questions. Rather, he is interested in whether the right questions have been asked, and what must be done if there are several, potentially conflicting, interests at stake. In a complex society, how can one do justice to the interests of the people of today, while also taking seriously the scientific 'worst case analyses' which relate to the effects on future generations? (Petersen [2011] 2012, 30–31)

On the basis of my reading of the implications of the condition of "post-normal science," I formulated four "guiding principles" for scientific advisers:

> Take "normal science" seriously, but also organize reflection on its uncertainties and value-ladenness.
>
> Alongside the statistical reliability of results (expressed in terms of probability), devote due attention to their methodological reliability (expressed in terms of strengths and weaknesses) and their public reliability (expressed as the degree of public confidence in the scientists who produce them).
>
> Involve a larger group of specialists and non-specialists who hold different values in monitoring the quality of scientific assessments.

> Be wary of accepting the conclusions of actors and practitioners at face value: try to delve deeper through the layers of complexity by means of narrative methods. (Petersen [2011] 2012, 31)

In terms of values, I would translate these four guiding principles into the values of "explicit reflection on uncertainty and values" (cf. Petersen et al. [2003] 2013); "addressing methodological and public reliability" (cf. Smith and Petersen 2014); "extended peer review" (cf. Petersen et al. 2011); and "acknowledging social complexity" (cf. Petersen in press). I argue that these values do not conflict with the Mertonian values of academic research, even if in the practices of academic research, these values oftentimes—but there are exceptions—only play a minor role. Below I argue for a fit between the values identified here and philosophical pragmatism, but first I highlight one "tool" that scientific advisers can use to address problems of sustainable development (which include the problem of climate change): the concept of "worldviews."

Worldviews and scientific advice on sustainable development

The uncertainties associated with my narrative above on solving climate change run deep and include the plurality in worldviews that exists among the actors involved. In order to clarify the concept of "worldviews," I make use of a study by Annick Hedlund-de Witt (2013) on its evolution in the history of ideas and on its relevance for informing the debate on sustainable development. Hedlund-de Witt covers Plato's *kosmos*, Kant's *Weltanschauung*, Goethe's *Lebenswelt*, Hegel's *Zeitgeist*, Nietzsche's perspectivism and Heidegger's thought on *die Zeit des Weltbildes*. After covering a number of contemporaneous currents as well (critical theory, integral theory and critical realism), she concludes her article with a useful overarching framework (the "Integrative Worldview Framework") in which she operationalizes five mutually related aspects of worldviews. She defines worldviews as follows:

> Worldviews are inescapable, overarching systems of meaning and meaning making that to a substantial extent inform how humans interpret, enact, and co-create reality. (Hedlund-de Witt 2013, 156)

Her Integrative Worldview Framework distinguishes between the aspects of ontology, epistemology, axiology, anthropology, and societal vision.

In relation to sustainable development Hedlund-de Witt observes several shifts in our cultural evolution. In the development of the philosophical concept of

"worldview" one witnesses increased attention to reflexivity, responsibility, creativity and inclusivity. And this offers good prospects for sustainable development. *Reflexivity* offers the possibility to consider alternative views on the meaning of development and quality of life—this is direly needed for explicit reflection on deep uncertainties. Our *responsibility* for first causing and subsequently solving world problems such as climate change has of course become immeasurably larger than how human responsibility used to be envisaged. *Creativity* can be seen as the most central element of a pragmatist approach to solving world problems. To make a start with imagining alternative development paths, other ways to produce and consume, another way of life and being—in short, to anticipate a wholly different future than a linear extrapolation of the past—can be the necessary first step of realizing such a world. Finally, *inclusivity* is needed to foster communication and collaboration among different actors, stakeholders, partnerships and networks, which are of increasing importance in the process to arrive at a sustainable society.

Philosophical pragmatism, science and public policy

Philosophical pragmatism can be divided into three phases, of which the third phase has just started in the 21st century (Margolis 2006). The first phase was comprised by philosophers like Peirce, James and Dewey, from the end of the 19th century until the Second World War. Phase two began in the 1970s and ran until the 1990s, with philosophers like Putman and Rorty. The present philosophical and societal problem that pragmatists wish to attack is about the implications of historicity, pluralism and relativism in a global context. Pragmatism may be able to offer fruitful possibilities to organize a dialogue that considers the consequences of different worldviews. Besides pragmatism's focus on fallibilism of knowledge (and values!) and its equation of "meaning" with "meaning in practices," Joseph Margolis sums up the following properties of present-day pragmatism:

> a naturalism that is neither reductive or eliminative; the avoidance of dualism and cognitive privilige of every kind; the evolutionary continuity between animals and humans; the rejection of any principled disjunction between theoretical and practical reason; the inherent informality of philosophy itself; the inseparability of fact and value; the denial of teleologism and fixed or final values; the historicity of all our conceptual distinctions; the flux of experience and of the experienced world; the unavoidability of consensual forms of rationality; and a basic trust in the exercise of human freedom bound only by its own sense of rational prudence. (Margolis 2006, 8)

Reflexivity, responsibility, creativity and inclusivity all figure in present-day philosophical pragmatism. What is ominously lacking is the concept of "worldview," which while being a useful tool for scientific advisers, must itself not be considered to "really" exist as something fundamental. According to first-phase pragmatist William James, for instance, "pure experience" is the one primal stuff that exists in the world, and knowing (and consciousness) can then be explained as relations between thought and thing, mind and matter, subject and object, which are all part of pure experience (see Petersen in press).

To sum up my argument: philosophical pragmatism, with its emphasis on fallibility and historicity of knowledge and values, and on their inseparability, serves as good philosophical starting ground for underpinning the values of scientific advice under uncertainty and ignorance, that is, for the ethos of scientific advice. It points out the need for reflexive practitioners at the science–policy interface, in addition to Pielke's (2007) four roles.

I conclude this essay by demonstrating the fruitfulness of philosophical pragmatism for connecting science and public policy specifically in the context of climate change or sustainable development, using two examples from present-day pragmatists: the notion of "societal experimentation and learning" (Bryan Norton) and the creation of new "publics" through "material participation" (Noortje Marres).

Norton (1999) situates himself as continuing in the tradition of Phase One (notably Peirce and Dewey) of pragmatism and develops a pragmatist approach to inquiry for social learning in pursuit of solutions to environmental problems. He observes that sustainable development is largely a quest, an "inquiry" without end. The attractiveness of not acknowledging a gulf between facts and values is that it offers the possibility to conduct scientific research based on a normative notion of sustainability. In addition to that, particularly Dewey has developed an approach to social learning in democracies which entails that institutions and procedures should be designed that are able to adopt an experimental approach to both science and policy. The sustainable outcomes cannot be defined beforehand, but they emerge from a program of active societal experimentation and learning. Also ethics is approached in a pragmatist manner by Norton and obtains an adaptive and evolutionary role.

Marres works at the boundary between philosophy and science and technology studies. In 2012, she published a book about "material participation," which addresses the question of how everyday publics for climate change emerge via technological devices. Marres builds on Dewey's 1927 book *The Public and Its Problems*, which I think is still of major importance for getting solutions to climate change off the ground. Before I get to Marres's additions I turn the attention to Dewey's book first.

A "public" for Dewey potentially comprises all who are affected by transactions in which they themselves are not engaged:

> When indirect consequences are recognized and there is effort to regulate them, something having the traits of a state comes into existence.
>
> (Dewey [1927] 2012, 46)

National states have emerged from the wishes of publics that were affected by escalating spirals of violence to have a monopoly of the state on violence. Meanwhile, states have taken on many more public tasks, because everytime new publics emerged in response to new problems. Dewey points to the importance of technological changes for the creation of new indirect consequences and—thus—new publics. First such publics are rudimentary and unorganized. Later they can organize themselves. However, when there are too many, too large changes, too many publics emerge which do not all have the means to organize themselves. This leads to what Dewey calls the "eclipse" of publics. It seems clear to me that at present, more than 85 years after Dewey published his book, this phenomenon of the eclipse of publics still occurs:

> [The present] age has so enormously expanded, multiplied, intensified and complicated the scope of the indirect consequences [of actions], has formed such immense and consolidated unions in action on an impersonal rather than a community basis, that the resultant public cannot identify and distinguish itself. (Dewey [1927] 2012, 110)

Still, I am not that sombre vis-à-vis climate change and its publics, if only because there are increasingly opportunities for publics to organize themselves—even with only a small role for states. Science can play a role here, but only if scientists do not focus solely on policy makers but instead on making connections between the different spheres of public policy making and the practices that stakeholders are engaged in, in a "transdisciplinary" manner. It is important that scientific information about climate change and possible solutions get absorbed and distributed within societies. The question for new publics has always been: How do I get my issue on the agenda? This is where framing and presentation play a major role; it is crucial to develop different ways of presenting a problem and/or solution in order to reach different groups of citizens and politicians. In the ecology of societal institutions, there is also a need for science advisory bodies that mirror social perspectives and that can be held publicly accountable (cf. Brown 2009).

Marres (2012) adds that publics do not only have discourses to participate in. She shows that technologies, such as the use of devices like smart meters, offer an alternative route for the participation of publics. This offers the interesting possibility of "mergers" of publics that express their concerns about the issue of climate change in different ways.

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