Futures xxx (2016) xxx–xxx

Contents lists available at ScienceDirect

Futures

journal homepage: www.elsevier.com/locate/futures

Original research article

The ethos of post-normal science

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ARTICLE INFO

Article history:
Received 18 August 2015
Received in revised form 28 November 2016
Accepted 6 December 2016
Available online xxx

Keywords:
Post-normal science
Norms of science
Science-policy interface
Science advice
Participation
Democratization of expertise

ABSTRACT

The norms and values of Post-Normal Science (PNS) are instrumental in guiding science advice practices. In this article, we report work in progress to systematically investigate the norms and values of PNS through a structured review. An archive of 397 documents was collected, including documents that contribute to the endeavour of ameliorating science advice practices from a PNS perspective. Action and structure-oriented viewpoints are used as complementing perspectives in the analysis of the ethos of PNS. From the action-perspective we study how prototypes of norms and values are reflected upon in negotiations of normative issues relating to science advice. From the structural perspective we study how interrelated prototypes of norms and values are presupposed in prescriptions, proscriptions, and goals for science advice practices. Through this analysis we identify a plurality of interrelated prototypes of norms and values. Finally, we propose an acronym that integrates the analysed plurality of norms and values. As a mnemonic and communicative devise we call this ethos TRUST (Transparency, Robustness, Uncertainty management, Sustainability, and Transdisciplinarity) and propose TRUST as a nexus for future reflective negotiations of ambivalences in post-normal practices of science advice.

1. Introduction

Public safety, credibility of science advice, and goals and conditions of science practices, are just a few examples of what is at stake in the debate over norms and values of science. Any attempt to discuss the ethos of science is immediately situated in a complex and multifaceted debate. This paper is a part of a larger project on the norms and values of Post-Normal Science (PNS), and it elaborates on an initial description of the ethos of PNS formulated by Kønig (2013). The objective of this report is to portray a prototypical structure of norms and values, and we propose that this structure may serve as a nexus for future reflective negotiations of normative trade-offs in practices of science advice striving to implement the concept of PNS.

PNS was developed in the mid 1980s by Silvio O. Funtowicz and Jerome R. Ravetz who portrayed three different problem-solving strategies in risk assessment: applied science, professional consultancy, and PNS (1991, 1992, 1993; 1985). Each strategy fits different types of problematic situations. When both system uncertainties and decision stakes are low, applied science can continue its routine work within a disciplinary matrix of shared assumptions (Kuhn, 1996). Applied science is what comes closest to core science. However, normal science puzzle solving is inadequate when stakes or uncertainties rise to a medium level. Professional consultancy is more appropriate under these conditions. Professional consultancy, the typical strategy of senior engineers and surgeons, involves uncertainty and stakeholder awareness, along with skills and

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http://dx.doi.org/10.1016/j.futures.2016.12.004
0016-3287/

judgement in the problem solving approach. Both applied science and professional consultancy are inadequate when facing post-normal conditions characterised by irreducible complexity, deep uncertainties, a plurality of legitimate perspectives, value dissent, high stakes, and decision urgency (Funtowicz & Ravetz, 1991, 1992, 1993).

The post-normal methodology for a more robust 'science for policy' involves an extended peer community, both internally and externally. The internal extension involves expert elicitations where multiple disciplines work together on the assessment of quality and uncertainty. The external extension is the inclusion of representatives from all relevant stakeholders in the processes of problem framing, choices of indicators, and quality assurance. The extended peer community involves broader notions of facts, including for example leaked documents, local experiences, and information provided by investigative journalists (Funtowicz & Ravetz, 1992, 1993). These 'extended facts' are highly relevant for the problem framing process and the choices of indicators. The extended peer community safeguards against pitfalls and errors such as tunnel vision (a to narrow framing of the problem to make it fit a single disciplinary approach) and Type III errors (a problem framing error leading to the assessment of the wrong problem).

The management of uncertainty involves a framework for the assessment and communication of uncertainty including not only technical and methodological uncertainties but also qualitative uncertainties such as epistemological and ethical uncertainties. The acknowledgement and management of plural legitimate perspectives involves among other things a framework for making it possible for stakeholders to engage in constructive and open dialogue cultivating mutual learning despite different disciplinary backgrounds, conflicting interests, and value disputes.

The goal of the post-normal methodology is to produce socially and technically robust information fit for sustainable decision-making. Avoiding pitfalls and errors such as tunnel vision and misapplication improves robustness and thus the quality of the policy advice.

When comparing "normal" to "post-normal" one can find plural and interesting differences, however for our purpose here we shall only point out one important difference, namely their contrasting conceptions of the very objective of science. In normal science the goal is knowledge, and quality equals certainty, not robustness. In PNS quality is the goal, not knowledge. Quality is not only about the product but also includes process, people, and purposes when information is to be fit for sustainable decision-making (Funtowicz & Ravetz, 1993). Due to these contrasts, one might be mislead to think that 'normal' and 'post-normal' are in contradiction. However, different tools are fit for different tasks. Post-normal does not substitute but complements normal science. PNS still needs normal science as long as normal science is not applied outside its jurisdiction of problems with low stakes and low uncertainties. Nevertheless, there are tensions between normal and PNS. One source of tension is the challenge of agreeing on the nature of the problem situation. There can of course be dissent when it comes to assessing the degree of stakes and uncertainties of a given issue. We shall return to the tensions between normal and PNS when analysing the ethos of PNS (Section 5) and when reflecting upon possible normative trade-offs and ambivalences in practices of science advice striving to implement the PNS framework (Section 7).

Despite the possible tensions between normal and post-normal, it should still be clear that the norms and values of the different problem solving strategies depend on and are developed under different conditions of problem solving. We elaborate further on this context dependency of norms and values in Section 2. Here, we simply wish to stretch that the situated character of norms and values serves as a premise when we analyse the ethos of PNS.

Our analysis of norms and values of PNS is inspired by Robert K. Merton's notion of an ethos of science (Merton, 1973). However, Merton's structural functionalistic approach to the sociology of science and his analysis of its norms have received substantial critique. Hence, before we describe the norms and values of PNS, the Mertonian legacy needs clarification.

2. The Mertonian legacy

Robert K. Merton's acronym CUDOS stands for: Communalism (a scientist ought to make knowledge accessible to other scientists, as knowledge is common ownership), Universalism (scientists ought to assess knowledge claims based on pre-established impersonal criteria), Disinterestedness (a scientist may not hold conflicts of interest that can corrupt the research results) and Organized Scepticism (scientists ought to conduct organised quality control of knowledge claims.) (Merton, 1973).

It has become common to refer to CUDOS as "Merton's norms". However, Hans Radder (2010) has reinterpreted CUDOS as values that are institutionalized through more specific norms described in codes of conduct. Merton himself described CUDOS as four sets of norms and values (Merton, 1973). But, as Radar rightly points out, one can find examples where Merton uses "mores", "imperatives", "norms" and "values" without clear criteria for the distinctions (Radder, 2010, p. 242).

We claim, like Merton, that an ethos of science involves both norms and values. We interpret norms and values as complementary when analysing how normative structures are presupposed in prescriptions, proscriptions, and goals of science advice. Norms relate to values as means to ends. Values are ends in view, something important to strive for and work towards, while norms are expressed in pre- and proscriptions of "how" when working towards certain ends in view. However, the relation between norms and values are dynamic. If one poses the question, is "universalism" a norm or a value? The short answer is, it depends on the framing of means and ends. If we interpret "universalism" as a means towards the end of extending certified knowledge, then "universalism" is a norm. However, if we zoom in on the activity of peer review, then the end in view of peer review is to provide impersonal quality control. From this perspective "universalism" is the underlying value of peer review.

Please cite this article in press as: N. Kønig, et al., The ethos of post-normal science, Futures (2017), http://dx.doi.org/10.1016/j.futures.2016.12.004