



Image: Dero2084 - https://stock.adobe.com/br/en/images/death-cap-in-the-forest-it-is-poisonous-mushroom-commonly-known-as-the-amanita-phalloides/273284647?prev_url=detail

Icon in page corners: Fungus icon by sumhi_icon from the Noun Project (<https://thenounproject.com/search/?q=toadstool&i=1326641>)

Post-Normal Science: How Does It Resonate With the World of Today?

Authors: Silvio Funtowicz, Jerry Ravetz

Key takeaways:

- Post-Normal Science approach operates in a reality that can be summarised by a fourfold statement:
 - Facts are uncertain,
 - values in dispute,
 - stakes high,
 - and decisions urgent.
- That initial insight expressed in Post-Normal Science is still important for helping in the diffusion of the lessons of this handbook.
- Post-Normal Science amounted to an existence theorem: there exists a class of policy-related scientific issues for which straightforward research studies, and even professional consultancy, are incomplete, inadequate or inappropriate. A plurality of new methods and new participants is required.

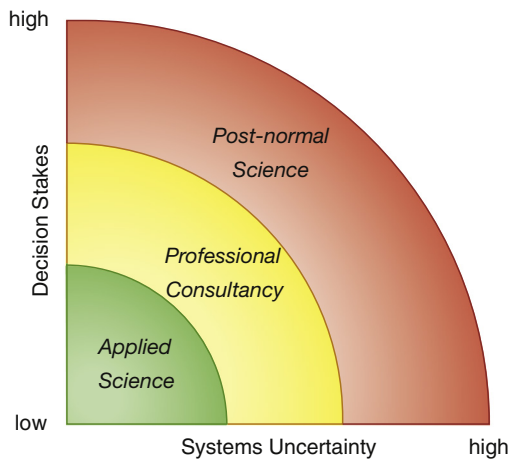


FIGURE 1 Post-Normal Science diagram.

authors, Silvio Funtowicz, arrived at the JRC when the idea was just taking shape, and the tolerant ambiance enabled him to engage in dialogue and thereby to develop and enrich the initial insight. He also built a base of understanding among colleagues, so that in many ways the present handbook embodies the approach of PNS. The JRC may therefore take credit for its role in nurturing PNS on its way to maturity.

Although it is rapidly gaining support in the policy science community, this approach is still far from universally understood. That initial insight, expressed in PNS, is therefore still important for helping in the diffusion of the lessons of this handbook. It is also useful to recall the context in which it emerged, since that inherited way of looking at science is still very much with us. For generations up to the very recent past, it was universally assumed that science simply provides us with truth, expressed in that ever-increasing body of facts that increase our knowledge and control of the world around us. Then policy advice, based on policy-related science, has a simple task, which is to speak truth to power.

Starting with the use of atomic weapons in WWII, followed by the development of the destructive H-bombs, it became clear that something had to change. But what? There was a succession of dramatic events, starting with *Silent Spring* (Carson, 1962), the Three Mile Island disaster (1979), then Chernobyl (1986) and afterwards the BSE ('mad cow') crisis in the United Kingdom (1986–2001). In the background was a series of drastic reversals of advice in health

The motto and diagram that define Post-Normal Science (PNS) are now quite familiar to those engaged in science for policy. With a small set of words and graphics, they express the essential features of the challenges of that field. We have the fourfold statement:

(1) Facts uncertain, (2) values in dispute, (3) stakes high and (4) decisions urgent. With this comes the triple-zone quadrant diagram (Fig. 1).

One critical feature of the diagram is the intermediate case, 'professional consultancy'. This enriches the structure so that it avoids conveying the message of a simple transition from a trouble-free past to a problematic present.

There is a close historic connection between PNS and the Joint Research Centre. One of the

“

For generations up to the very recent past, it was universally assumed that science simply provides us with truth, expressed in that ever-increasing body of facts that increase our knowledge and control of the world around us.

”



and nutrition, notably cholesterol and heart disease. The initial response of risk analysts to the new challenges was to make computer models of the hazardous situation with probabilities assigned to the unwanted events, so that policymakers would have precise numbers to guide their decisions. But when uncertainties were incorporated into the calculation, all too often the risk would be characterised as ‘zero-infinity’, a vivid way of expressing a situation where the probability is unmeasurably small, but the possible damage is unmeasurably large. Such dilemmas were captured by the concept of ‘trans-science’ developed by Alvin Weinberg (1972), but he saw the problem as a simply quantitative one, to be resolved by the development of improved measurement methods.

The authors of PNS were well prepared to engage in a creative partnership to enhance this understanding. Jerry Ravetz had already published his seminal work *Scientific Knowledge and its Social Problems* (1971) and had drafted *The Acceptability of Risks* (1977) for the Council for Science and Society. He had also begun reflections on quantitative reasoning and its pathologies. Silvio Funtowicz had a background in mathematics and logic and had already worked on risk analysis at the practical and theoretical levels. Their first joint effort focused on quantification; its product was *Uncertainty and Quality in Science for Policy* (1990), where they developed the NUSAP notation. Their introduction of the idea of quality of scientific information (expressed in the Pedigree category) suggested an extension of their analysis beyond the field of risk assessment, to policy-related science in general. By then, it was clear to them that in policy debates involving science, it was unwise to assume either that uncertainty could be tamed, as with error bars, or that quality could be taken for granted.

In the early days, the sympathetic editor of *Futures* journal, Zia Sardar, facilitated the publication of papers on and around the PNS theme. Contacts were made with the ecological economics community and through that to scholars developing new ideas of complexity. From its scientific origins in risk analysis, PNS has evolved to encompass complexity and governance, although the original formulation has still seemed to serve well. Interest and support have grown gradually, as always in the early phase of an exponential process. Zia’s confidence has been repaid. In a recent survey, the 1993 essay *Science for the Post-Normal Age* received the highest number of citations by all publications, which deal with futures, anticipation and prediction.

One additional feature of the PNS analysis gradually came to prominence. Viewed abstractly, PNS amounted to an existence theorem: there exists a class of policy-related scientific issues for which straightforward research studies, and even professional consultancy, are incomplete, inadequate or inappropriate. The corollary is that if such problems are to be resolved, a plurality of new methods and new participants will be required. Thus was born the ‘extended peer community’. Precedents existed, as in ‘popular epidemiology’, the community scientists at the polluted Love Canal, New York, and the concerned parents at Lyme, Connecticut. Although agreed on the need of

“

There exists a class of policy-related scientific issues for which straightforward research studies, and even professional consultancy, are incomplete, inadequate or inappropriate.

”



such an extension, many scholars sensed that this was one radical innovation too far, and in their interpretation of PNS, they have substituted the ‘extension of peer review’ for the more challenging ‘extension of the peer community’. Now that the concepts of ‘engagement’ and ‘cocreation’ are commonplace, it is useful to be reminded that this transformation of the politics of policy science did require some deep reflection.

The full public maturing of PNS arrived about two decades after the original defining paper (1993). In 2014, the leading scientific journal *Nature* published a paper by a well-respected policy scientist, in which ‘Post-Normal’ appeared in the title. He is Sir Peter [Gluckman](#), then Chief Scientific Advisor in New Zealand and now President-Elect of the prestigious International Science Council. In his article, and in numerous essays since then, he has shown how his experience led him to incorporate the insights of PNS as the way to understand the challenges of his work.

The JRC has already promoted activities that support the development of PNS, and the extension of its critical insights to other areas. Among them is the organisation of the second PNS symposium, New Currents in Science: The Challenges of Quality (PNS Symposium, 2016 <https://ec.europa.eu/jrc/en/event/workshop/challenges-quality>). We can now expect more initiatives here and elsewhere, as the lessons of this handbook become understood and diffused.

The contribution of PNS to our understanding of science in society can be summed up quite simply: In the social process of science, quality is achieved, not by a delusory pursuit of certainty, but by the skilled management of its uncertainties, involving all who have a concern for the issue. It is very encouraging indeed that this handbook articulates this insight so effectively.

“

In the social process of science, quality is achieved, not by a delusory pursuit of certainty, but by the skilled management of its uncertainties, involving all who have a concern for the issue.

”