

Decalogue of the diligent quantifier. A Pledge

VERSION 2

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INTRODUCTION

The present difficulties in the quality control of science *qua science* are very visible to both the directly concerned institutions and the media, with daily reminder of reproducibility failures, of peer review dysfunctions and of the ills brought about by perverse metrics used to appraise research and researchers (Begley and Ioannidis, 2015). The predicaments of science for policy and science advice are likewise evident (Sarewitz, 2015). Surprisingly little discussion takes place on the interlinkages between these two important processes. A recent OECD report (2015) entitled ‘Scientific Advice for Policy Making’ chooses to ignore science’s governance difficulties altogether. One exception is Benessia et al. (2016), which discusses the crises’ root causes, the implications for policy, and the potential remedies. Points of attrition where the interplay between the two crises are particularly evident are:

- The paradigm of evidence-based policy
- The use of science to produce implausibly precise numbers and reassuring techno-scientific imaginaries
- The use of science to ‘compel’ decision by the sheer strength of ‘facts’

In all these the role of mathematical and statistical modelling and the construction of statistical indicators play a key role. These tools are of paramount use and importance for policy, while being at the same time the most prone to degeneration and corruption, as the involved communities testify every day: see e.g. the recent furore about p-hacking [an unscrupulous chase for significance obtained by abusing statistics, (Shanks et al., 2015)] and the true nature of p-values (Wasserstein and Lazar, 2016). Statisticians rediscover today that the use of methods demand normative choices (Rudner, 1953; Ravetz, 1971). The situation with modelling has become so serious, and instances of sloppy model based inference so numerous and grave in their consequences (Saltelli et al., 2013) that an urgent action of reform is called for, all the more so since there appear to be an important segment of the scientific community unaware or set on ignoring that something grave is going on (OECD, 2015). What is to be changed? Which tools, practices, critical skills and processes of quality control are needed for models used at the science-governance interfaces to aid in the responsible use of quantification? How can these be fostered in a climate unconducive to ethical responsibility within the same house of science? Here we start with a pledge on responsible quantification, in ten points.

THE PLEDGE

1) I don't quantify at gun point

Quantification and trust are symbiotic, see in Porter, 1985, the discussion of the different settings for the US Army Engineers vs Engineers du Ponts et Chaussées. When quantification

is mandatory its quality may suffer.

2) **I avoid quantifying *sub specie aeternitatis***

The thing being measured, the measurement scheme, the interests determining the relevance of the observation change with time and scale. Cost benefit analysis of socio-economic-ecological systems extending decades into the future are delirious. See Winner 1986; Saltelli et al., 2013.

3) **I avoid apprentice wizardry**

Quantification should be run by the competent/relevant discipline given the subject matter; if I am an economists I can quantify only under moderate scarcities. See Ravetz, 1994.

4) **I exert restrain**

My license to quantify is also a license not to quantify. Not because I can put it in numbers I put it in numbers – see Saltelli et al., 2013, the first rule of sensitivity auditing.

5) **I won't sweep my assumptions under the carpet**

Quantification based on 'guesstimates' of input needed by the quantification algorithms are only as good as the guesstimates. See Stark, 2015; Saltelli et al., 2013, second law of sensitivity auditing; Kay, 2015.

6) **I will be mindful of what frames I am exploring**

Each quantification belongs to a frame. Frames induce hypocognition. See Ravetz, 1987; Saltelli and Giampietro (2016).

7) **I will be inquisitive of the motives behind quantification**

Quantification is an artifact; 'Any artifact will have: intended use, creative new use, incompetent misuse and malevolent abuse'. With different wording the concept can be traced to Ravetz, J., 1971.

8) **I am mindful of the need for each measure to have a stable external referent**

Quantification requires a stable pattern to be recognized and measured - what is determining the pattern? How stable is the pattern? See Giampietro et al., 2006.

9) **I don't forget the distinction between "type" and "instance of a type"**

Quantification is only useful to describe types. The problem is that the "reality" is made of instances that are all special; see Giampietro, 2015.

10) **I can see and measure entities only one scale at the time**

What I measure at one scale does not exist at another scale. See Giampietro, 2004; Giampietro et al., 2013.

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