LIMITATIONS OF RISK ASSESSMENT

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ABSTRACT

The risk analysis paradigm is a powerful tool for the assessment and management of risks in numerous domains of public concern. It produces useful, unambiguous information as long as the necessary care is taken to ensure proper communication of the uncertainty inherent to its inputs and outputs. Alternative methods, such as scenario analysis or fuzzy logic analysis, offer equally useful approaches, but all partners must be aware that recourse was taken to these alternatives because the risk could not be quantified correctly.

CONTENT

The first recorded reference to risk analysis is attributed to Pericles in his famous funeral speech before the assembled Athenians (Thucydides, 431 BCE), although it does take some imagination to interpret the paragraph in question as an example of rational risk assessment and risk management. Trying to understand the etymology of the word 'risk' is in itself an interesting pursuit: generally accepted appears the Greek root *peirao* (danger), coming to us via the Latin *periculum*, although one must admit encountering the Latin *resecare* (to cut back) quite regularly as well.

An unambiguous definition of the concept 'risk' is even more of a problem, as Kaplan (1997) reminds us: *Many of you here remember that when our Society for Risk Analysis was brand new, one of the first things it did was to establish a committee to define the word 'risk'. This committee labored for 4 years and then gave up, saying in its final report, that maybe it's better not to define risk. Let each author define it in his own way, only please each should explain clearly what that way is.* The real problem would seem to be people tending to forget the second part of the last sentence.

Irrespective of the definition, the risk assessor must be able to communicate two important quantities to the risk manager: first, the probability that something will or will not happen and, second, how certain one is about one's assessment. Ensuring correct transmission of the level of uncertainty in the estimate, the lack of knowledge, the lack of reliable information is just as important as reporting an average, median or modal probability. But this aspect is all too often overlooked when people attempt to develop a novel approach to measure risk.

The central issue always has been (and still is and will remain to be so) finding a common language in which to communicate lack of knowledge. An obvious (and ideal) vehicle consists of the framework offered by the probability theory, in which it is possible to precisely quantify the level of uncertainty in an unambiguous way. Unfortunately, many people refuse to accept a situation where uncertainty is so overwhelming that the only correct way to inform the risk

manager is to state 'I know nothing'. Fear for the application of the precautionary principle is usually the motive to insist on performing a risk analysis anyhow.

A common way to overcome the absence of reliable and usable information is to resort to a so-called qualitative approach. A discussion on quantitative versus semi-quantitative versus qualitative is in the end an aimless and counterproductive undertaking. What is important is on the one hand to ensure that both sides (risk assessors and risk managers) understand the methodology used (i.e. ensure there is a common language) and on the other hand to guarantee that the uncertainty about the parameter estimates is clearly communicated. As stated before, ideally probability distributions are used (Aven, 2003, 2010; Stirling, 2007), but other systems, respecting the basic properties of probabilities (i.e. comprehensiveness and mutual exclusiveness) can also be employed (Maudoux *et al*., 2006).

Potential problems arise when systems to measure and communicate risks are developed that do not adhere to the basic principles of probability theory (see above) but that make use of scales typical of fuzzy logic (e.g. Anon, 2008). Computation rules and final defuzzification are specific to this domain and are not always amply understood by both risk assessors and managers, who may both underestimate the uncertainty of the inputs and outputs during this process. The assessors should make it absolutely clear that this approach is strictly speaking not a risk analysis and managers should understand the implications. Essentially the same remark goes for the application of scenario analyses, but it should nevertheless be clear that, given transparent communication, both approaches are perfectly valid, as was shown in the case of the risk evaluation of *Trichinella* in Belgium (Advice 23-2009, Sci Com FASFC).

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