

## **Uncertainty and Risk: Politics and Analysis.**

by

Robert Hoppe

**Do not quote without author's consent.**

Paper prepared for the Workshop on science policy guidelines for risk analysis, University of Bremen, 6-7 October 2006.

R. Hoppe

Faculty of Business, Public Administration and Technology

Policy Science Unit

Twente University

P.O. Box 217

7500 AE Enschede, The Netherlands

phone +31 53 489 4684

email [r.hoppe@bsk.utwente.nl](mailto:r.hoppe@bsk.utwente.nl)

## **Abstract**

In environmental and sustainable development policy issues, and in infrastructural megaprojects and issues of innovative medical technologies as well, public authorities face emergent complexity, high value diversity, difficult-to-structure problems, high decision stakes, high uncertainty, and thus risk. In practice, it is believed, this often leads to crises, controversies, deadlocks, and policy fiascoes. Decision-makers are said to face a crisis in coping with uncertainty. Both the cognitive structure of uncertainty and the political structure of risk decisions have been studied. So far, these scientific literatures exist side by side, with few apparent efforts at theoretically conceptualizing and empirically testing the links between the two. Therefore, this exploratory and conceptual paper takes up the challenge: How should we conceptualize the cognitive structure of uncertainty? How should we conceptualize the political structure of risk? How can we conceptualize the link(s) between the two? Is there any empirical support for a conceptualization that bridges the analytical and political aspects of risk? What are the implications for guidelines for risk analysis and assessment?

## **1. Introduction<sup>1</sup>**

Ever since the Enlightenment and the Age of Reason, science is ascribed and eagerly has taken up the role of ‘provider of certainty’. Largely disregarding dissenting voices by important scholars like Hume - the father of comparative research designs in political science - most scientists have been educated to relegate uncertainty to an error-term in their mathematical formulae representing reality; an error-term certain to be reduced to zero by scientific progress. Although since the fifties the fallibilist ideas of critical rational epistemology have gained much ground, science still generally treats uncertainty as a nuisance to be reduced as much as possible.

This basic attitude is at the source of a lot of nasty surprises. In the 1980’s and 1990’s, now that the Age of ‘Science, the Endless Frontier’ has definitely been superseded by the Age of ‘Strategic Science’ (Rip, 1997), science is forced to perform constant boundary work with economic and political institutions. Scientists are called upon to produce ‘extended facts’ (Funtowicz & Ravetz, 1990) and ‘serviceable truths’ (Jasanoff, 1990) for economic managers and public policymakers who deal with ‘wicked’ or unstructured problems (Hisschemöller & Hoppe, 1996, 2001) of a trans-scientific nature (Weinberg, 1972; Hoppe, 1998). Certainly in environmental and sustainable development policy issues (WRR, 1994; Vermeulen et al., 1997), in infrastructural megaprojects

---

<sup>1</sup> An early version of this paper was prepared for and discussed at the NOB/NIG 2002 Conference, Uncertainty and Trust, Working Group 7 on ‘Knowledge Uncertainty’, Erasmus University Rotterdam, 30-31 October, 2002. The author gratefully acknowledges input and discussion by drs. Simône Huijs. Responsibility for the paper rests fully with the author.

(Flyvbjerg et al., 2003), and in innovative medical or pharmaceutical technologies (Callahan, 2003), public authorities time and again face emergent complexity, high value diversity, difficult-to-structure problems, high decision stakes, high uncertainty, and thus risk. Some even speak of a 'risk society' (Beck, 1992) to sociologically characterize our times. Between the sixties and nineties of last century, policy issues like technology criticism, environmentalism and, later, sustainable development, gave rise to the institutionalization of policy discourse on, and policy analytic techniques for dealing with, uncertainty and risk. The budding literatures on risk assessment, (medical) technology assessment, and, more recently, integrated assessment, bear testimony to these developments. But in practice, it is argued that public authorities more and more often face crises, and frequently get entangled in deadlocked controversies (Van Eeten, 1999), heading for policy fiascoes (Bovens & 't Hart, 1996). Even recent newspaper reports on the way renowned research Dutch institutes like the National Institute for Public Health and Environment (RIVM), the Census Bureau (CBS) and the Central Economic Planning Agency (CPB) deal with policy relevant uncertainties, assume that decision-makers face a kind of crisis in coping with rampant, *inherent uncertainty* - i.e. science cannot or no longer reduce the error-term for them, in spite of its past track records and promises for the future. It has become abundantly clear that more knowledge production does not imply less uncertainty; and in such a situation science faces more and more barriers to deliver 'serviceable truth' to politics and the public. To some, particularly post-modernist intellectuals, science is on, or past, the verge of losing its cognitive authority and privilege in contemporary society.

## **2. Problem and theoretical approach**

Given the state of affairs sketched in the introduction, this exploratory paper addresses the following problem: How should we conceptualize the cognitive structure of uncertainty? How should we conceptualize the political structure of risk? How can we conceptualize the link(s) between the two? The answer consists in an attempt at theoretical synthesis between hitherto separate theoretical strands of thinking about the relations between science, uncertainty, risk, and politics. The first strand is standard epistemological thinking about the cognitive structure of uncertainty and risk, and its concomitant methods of uncertainty analysis. Funtowicz & Ravetz' (1994), Van Asselt's (2000) and Hisschemöller's et al. (2001) demonstration of the emergence of a *post-normal scientific practice* in dealing with problems of high uncertainty and value-loading, clearly shows that 'puzzle-solving' (Kuhn) and the expectation of 'normality' (and predictability and control) are no longer satisfactory assumptions for methods of uncertainty analysis. The second strand of thinking concerns the political aspect of

risk analysis, assessment and management. In this paper, I will use the cultural theory of the political construction of risk, as pioneered by Douglas & Wildavsky (1982; see also Hoppe & Peterse, 1993), rooted in Douglas' anthropological and sociological *grid/group cultural theory* (Douglas, 1970; 1986). More particularly, I will use here Jerry Ravetz's (2001) creative effort in deriving a cast of (idealtypical) political actors in the narrative structure of risks. Over the last fifteen years, Hisschemöller & Hoppe have developed their theory about types of *problem structuring* in policymaking (Hisschemoller & Hoppe, 1996) into a third strand of theorizing about the relations between problem types, policy process types, and types of scientific practice (Hisschemöller et al.,1998; Hisschemöller et al., 2001). Although each of these theories has roots in different intellectual traditions and practical concerns, they are treated here as complementary perspectives to be synthesized . In the first three sections, the structure of this paper simply follows the sequence of the three questions posed at the beginning of this section. Section four illustrates the empirical plausibility of the theoretical synthesis in a number of brief case narratives. Finally, section five mentions some implications for guidelines in scientific risk analysis.

### **3. How should we conceptualize the cognitive structure of uncertainty?**

Given the discovery of uncertainty, error and evil in science in the second half of the 20<sup>th</sup> century, and, especially during the last decade, in dealing with problems of uncertainty in sustainable development topics, scientists themselves started to unravel the cognitive structure of uncertainty and study how it is dealt with. The results have recently been surveyed and summarized by a number of Dutch studies (Van der Sluys & Schulte Fishedick, 1997; Van der Sluys, 1997; Van Asselt, 2000). At the highest level of aggregation, uncertainty arises from the compounded effects of variability and lack of knowledge. Variability and lack of knowledge each may stem from different sources. A provisional taxonomy distinguishes between no less than ten different sources. Variability is in principle attributed to 'reality' or the 'object' of knowledge; and lack of knowledge is said to be an in principle attribute of the knowing 'subject'. At the very least scientific work on the cognitive structure of uncertainty justifies speaking of truly inherent and compounded uncertainty (see **Figure 1**).

FIGURE 1. TYPOLOGY OF SOURCES OF UNCERTAINTY.

(Source: Van Asselt, 2000:87)

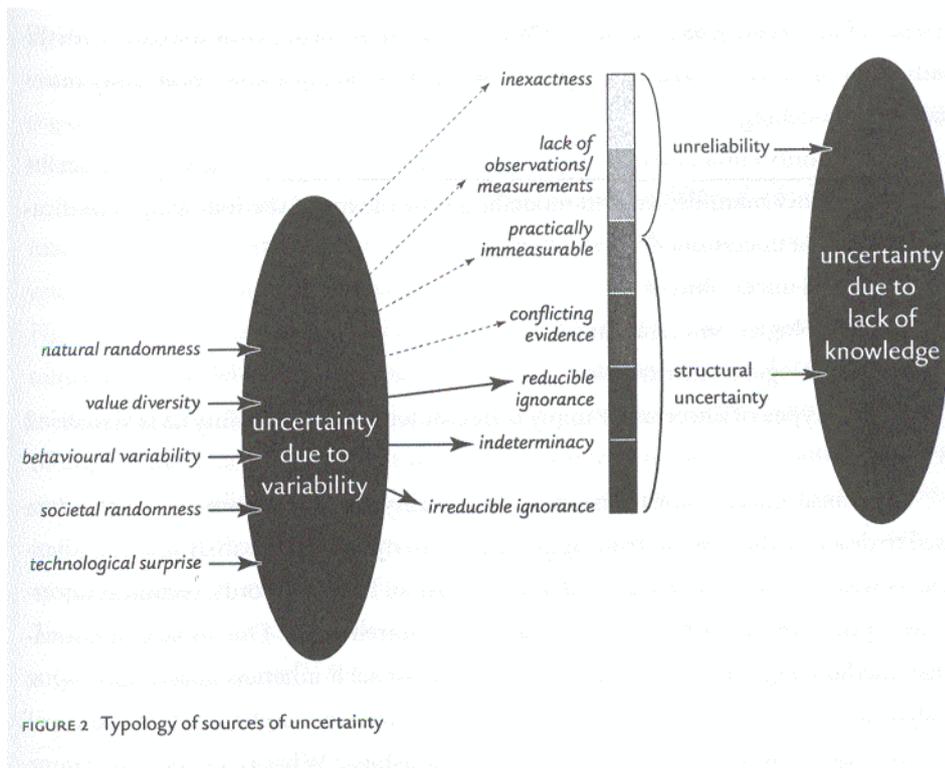


FIGURE 2 Typology of sources of uncertainty

Usually, this compoundedness is subdivided into three main categories: epistemological, methodological and technical uncertainty. *Technical uncertainties* stem from lack of knowledge. They pertain e.g. to model quantities like parameters, initial states and inputs. Uncertainties due to variability generate *methodological uncertainty*: what analytical tools are appropriate in view of so much randomness in physical nature and unpredictability in human behavior? Given the lack of understanding of institutional processes, how to model causal relationships? And how to deal with value diversity in a methodologically sensible way? In modeling, methodological uncertainties materialize as uncertainty about model form. *Epistemological uncertainties* concern the conceptualization of phenomena *per se*: we are uncertain as to whether or not (and the degree to which) a concept or model or theory relates at all to the ‘real’, variable world. In modeling, such uncertainties surface as worries about model completeness, and, consequently, about the possibility to validate or test the model.

By focusing on *uncertainty in decision-making*, another classification of uncertainty is worth mentioning (see **Figure 2**).

FIGURE 2. UNCERTAINTY IN DECISION-MAKING

(Source: Van Asselt, 2000: 80)

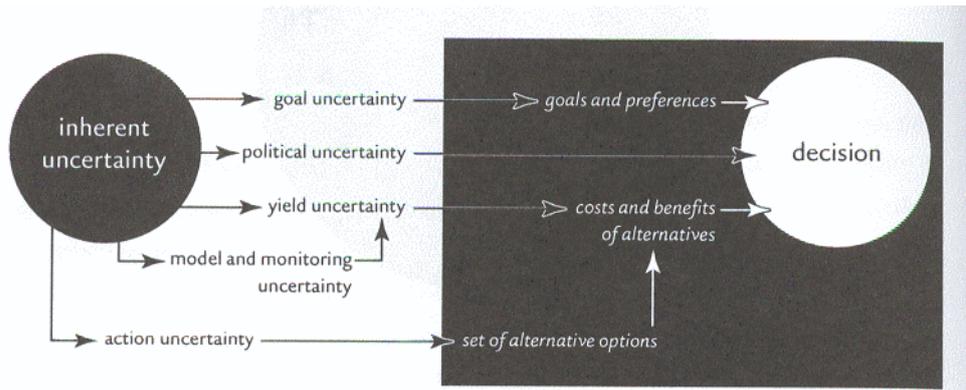


FIGURE 4 Uncertainty in the decision-making process

Due to inherent uncertainty a decisionmaker is uncertain as to the set of available actions and alternative options (action uncertainty), and their potential consequences (yield uncertainty). Model uncertainty, doubts about the model(s) s/he uses, may contribute to yield uncertainty. Due to a frequently occurring high amount of value diversity, goal uncertainty is generated; this affects uncertainties about costs and benefits, which compounds the yield uncertainty. On top of this, the decision-maker may struggle with uncertainty as to the political acceptability of options. Any brief look into methods of cost-benefit analysis or multi-criterion *ex ante* evaluation will convince the reader that multiple uncertainties arise and that they accumulate in the decision.

#### *Uncertainty analysis, uncertainty management, and political judgment*

One way of dealing with uncertainty is to unravel and analyze it. There are quantitative and qualitative methods of uncertainty analysis. *Quantitative uncertainty analyses*, evaluating to what extent particular types of uncertainties impact upon modelling outputs, are e.g. sensitivity analysis, probability-based methods, formal scenario analysis, hedging-oriented methods, and validation approaches. Quantitative uncertainty analysis only pertains to model inputs, and cannot address model form or model completeness. The latter two methods - hedging and validation - are slightly more sophisticated, because they address not only model uncertainty, but, through incorporating action and yield uncertainties, try to keep uncertainties within bounds of credibility for decisionmakers. In other words, they are not just about *analyzing* (model) uncertainty, they are about *bounding* (action and yield) uncertainty.

Formal, quantitative uncertainty analyses remain ambiguous as to the acknowledgement of subjectivity and inherent uncertainty. Not so in *qualitative analyses of uncertainty*, like qualitative scenario development, interactive problem and uncertainty structuring, and methods like Funtowicz' and Ravetz's NUSAP-method (Funtowicz & Ravetz, 1990) for sifting uncertainties in irreducible and (perhaps, in the future, through careful

research) reducible uncertainties. Such approaches do not seek to analyze or bound uncertainty by scientific means alone. They try to manage it by publicly articulating the hidden assumptions and subjective elements human decision-makers are bound to use in order to ‘trans-scientifically’ *manage* uncertainty as best they can. All in all, Van Asselt (2000: 107) concludes that “uncertainty analysis is in crisis, due to the lack of a set of methods that enables to address salient technical, methodological and epistemological uncertainties in an adequate manner as central activity in scientific assessment.” (see **figure 3**)

FIGURE 3 SOURCES OF UNCERTAINTY AND METHODS OF UNCERTAINTY ANALYSIS

(Source: Van Asselt, 2000:106)

source	method
Inexactness	<ul style="list-style-type: none"> <li>• Probability-based methods</li> <li>• Formal scenario-analysis</li> </ul>
Lack of observations/ measurements	<ul style="list-style-type: none"> <li>• Probability-based methods</li> <li>• Formal scenario-analysis</li> <li>• Hedging-oriented methods</li> </ul>
Practically immeasurable	<ul style="list-style-type: none"> <li>• Probability-based methods</li> <li>• Formal scenario analysis</li> <li>• Hedging-oriented methods</li> </ul>
Conflicting evidence	<ul style="list-style-type: none"> <li>• Formal scenario-analysis</li> <li>• Hedging-oriented methods</li> </ul>
Ignorance	<ul style="list-style-type: none"> <li>• Validation</li> <li>• Qualitative scenario-development</li> <li>• Interactive problem and uncertainty structuring</li> </ul>
Indeterminacy	<ul style="list-style-type: none"> <li>• Interactive problem and uncertainty structuring</li> <li>• Qualitative scenario-development</li> </ul>
Natural randomness	<i>Stochastic modelling<sup>50</sup></i>
Value diversity	<i>no methods</i>
Behavioural variability	Scenario-approaches
Societal randomness	Scenario-approaches
Technological surprise	<i>no methods</i>

TABLE 5 Potential of discussed methods in addressing different sources of uncertainty

One could argue that politicians and policymakers compensate for the shortcomings of scientific uncertainty analysis by substituting it for their own forms of less articulate political judgment. *How about the way political judgment (as cognitive strategy) deals with uncertainty?* First, there is the undeniable inclination for politics to (ab)use or hide behind scientific authority in uncertainty issues. Second, where this is patently harmful to both politics and science, political judgment appears to have its own ways of *coping with uncertainty*. Basic ideas in political judgment like Popper’s piecemeal social engineering and Lindblom’s incrementalism aim to reduce and circumvent uncertainty in public policymaking through trial-and-error strategies that avoid irreversible and potentially catastrophic consequences. Hogwood and Gunn (1983) generally advise policy analysts to guess

roughly right than predict exactly wrong. They also suggest strategies of making policy flexible; e.g. by keeping options open in early project phases, and narrowing down later when key uncertainties have been eliminated. Woodhouse and Nieuwsma (2001) argue for strategies to improve on traditional incremental policy analysis and design (Braybrooke & Lindblom, 1963). They want to speed up adaptation through learning, “failing softly and learning quickly”. For them, this means two tactics. First, to incorporate flexibility in policy programs, and prudence in upscaling new technologies and methods. Under this heading they list coping strategies like ‘minimize up-front capital investment’, ‘keep lead times short’, ‘keep unit size small’, and ‘minimize infrastructure dedicated to the endeavour’. Danish small-scale wind-turbine technological development, as opposed to very fast up-scaling and marketing of the technology by the big energy suppliers in California probably is a good example (Van Est, 1998). The second tactic involves fast and intelligent learning. Under this rubric they list coping strategies like ‘attack egregious risks first – those clearly worst than others even after allowing for uncertainties’, ‘actively seek and develop alternatives that transcend or circumvent risk’, ‘develop carefully prioritized (focussed) research strategies to reduce key uncertainties’, and ‘be actively prepared to learn from error, rather than naively expecting to fully analyze risks in advance or passively waiting for feedback to emerge’. Here they suggest to involve stakeholders in the learning process - a suggestion that approximates Funtowicz’ & Ravetz’s advice to rely on ‘extended peer review’ under circumstances of post-normal science. Such strategies of political judgment, substituting for scientific uncertainty analysis, appear to have in common a focus on *strategic choice* and *robustness* or *resilience*.

#### **4. How should we conceptualize the political structure of risk?**

The typical political way of dealing with uncertainty appears to be to create a story about risk, called the *structure of risk* (Palmlund, 1992; Ravetz, 2001; cf. Bovens & ‘t Hart, 1996:53ff). Any risk situation, from a political point of view, is constructed as an idealtypical *political role structure*, i.e. a ‘cast’ of political characters that plays more or less fixed types of roles in risk policies as socio-political spectacles and dramas.. First, there is a party whose behavior, intentionally or not, is the cause of (potential) adverse consequences to other parties. This party is the *risk imposer*, because, by sticking to his course of action, this party imposes consequences on others who bear them involuntarily. Second, some of those who experience the adverse consequences of the risk imposer’s behavior, will just (unconsciously, perhaps) suffer or endure them - they are *risk endurers*. But, third, some others, who also suffer the adverse impacts, will actively try to evade them. They can be called *risk rejectors*. Fourth, usually there exists a party whose task is to somehow regulate the risk, a *risk regulator*. In this rudimentary political theory of risk situations, what happens about the risk is a consequence of the

communication patterns, skills, strategies of using resources, and power interdependencies among the incumbents of these four roles.

In order to enrich our understanding of the four roles by depicting their *action styles*, Ravetz uses group/grid cultural theory (gg/ct). In gg/ct the *grid* dimension indicates whether or not people positively identify with (political) authority and leadership; scoring high on grid means that you are an ‘insider’; scoring low means you are an ‘outsider’. The second dimension is called *group*, and indicates to what extent you identify (and are identified by others) with well-defined collectivities; scoring high makes you a ‘collectivist’, scoring low an ‘isolate’. Mapping the four political risk roles on the gg/ct double axis typology, you derive four action types, one per risk role:

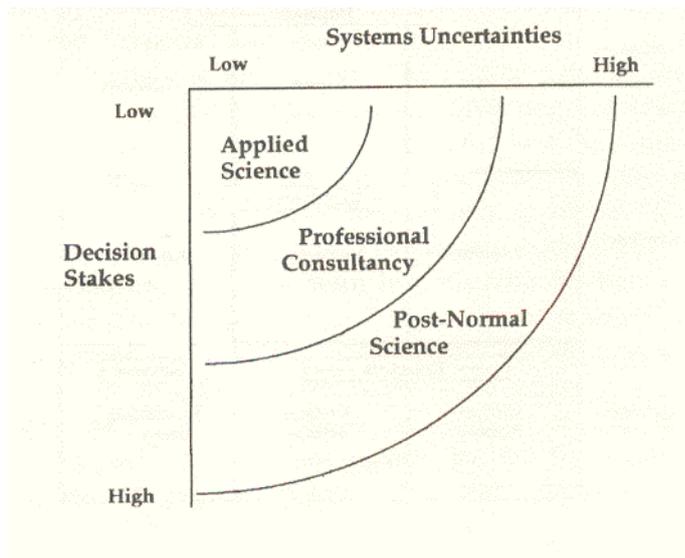
Figure 4. Political risk structure and action types		
	<b>collective</b>	<b>isolated</b>
<b>insider</b>	role: risk regulator action type: administrator	role: risk imposer action type: entrepreneur
<b>outsider</b>	role: risk rejector action type: campaigner	role: risk endurer action type: survivor

To put some empirical flesh on these analytical bones, let us very briefly turn to the controversy on Schiphol Airport. Discourse analysis of the political and societal debate has identified its typical discursive frames (Van Eeten, 1999). You are either in favor of expansion of civil aviation infrastructure due to future international competitive advantages. This reflects the debate position of *risk imposers* who act like entrepreneurs exploiting a business opportunity. Or you consider expansion a waste of public money; which is the typical debate position of *risk rejectors*, like the environmental movement and alarmed community groups, who act as campaigners and protesters, in the process claiming to also represent the position of the ‘silent majority’ of *risk endurers* who only try to survive the nuisances or ‘external effects’ heaped upon them by the airport/aviation business. The third discursive frame in the controversy - local and regional accommodation of a growing airport business to minimal living environment standards - is typical for the administrative style of *risk regulators*, represented by governmental agencies.

Ravetz’s ideas about the political structure of risk issues can be extended to incorporate the role of science and scientists. Ravetz has argued that the role of science and scientific rules covary with the degree of complexity/uncertainty and the amount of decision stakes involved in policy issues. (see **figure 5**)

FIGURE 5. Postnormal science, uncertainties and decision stakes

(Source: Ravetz, 2001: 487)



In policy issues with low uncertainty and decision stakes, science can safely go by the rules for truth-finding in *normal (applied) science*. When policy issues show moderate uncertainty and decision stakes, the rules of *professional consultancy* take over in extracting from given bodies of scientific knowledge those insights that ‘best’ apply to the decisions to be taken. In cases of high uncertainty and (very) high decision stakes, Ravetz speaks of a condition of ‘*post-normal science*’, where the quality of scientific assessments or plausibility claims can only be warranted through *extended peer review* by non-scientific stakeholders. We may summarize Ravetz’s theoretical argument in the following scheme:

**Figure 6.** The political structure of risk and types of scientific practice

	<b>collective</b>	<b>isolated</b>
<b>insider</b>	<i>political role:</i> risk regulator <i>action type:</i> administrator <i>scientist’s role:</i> monitor, inspector, technical expert <i>scientific rules:</i> normal applied science	<i>political role:</i> risk imposer <i>action type:</i> entrepreneur <i>scientist’s role:</i> advocacy expert, consultant, advisor, research expert <i>scientific rules:</i> some normal applied science + professional consultancy
<b>outsider</b>	<i>political role:</i> risk rejector <i>action type:</i> campaigner <i>scientist’s role:</i> critical scientist, conceptual or value clarification, discursive mediator <i>scientific rules:</i> professional consultancy and post-normal science	<i>political role:</i> risk endurer <i>action type:</i> survivor <i>scientist’s role:</i> citizen’s science, sensitizing science, clarifier/mediator  <i>scientific rules:</i> post-normal science

## 5. How can we conceptualize the link(s) between the cognitive uncertainty and political risk?

The conceptual 'bridge' between the cognitive structure of scientific uncertainty and the political structure of risk, I propose, can be constructed with the help of a typology of policy contexts as configurations of policy problem types and policymaking process/network types as developed by Hisschemoller & Hoppe (1996).<sup>2</sup> Theirs is a social constructivist theory of problem framing and structuring, applied to political contexts of public policymaking.

One has a problem when one experiences a gap or disparity between a moral standard and an image of a present or future state of the world. Someone who claims to be plagued by a problem, implicitly or explicitly passes a moral judgment. S/he uses a standard involving value or worthlessness, desirability or undesirability, to pass judgment on present or expected acts or situations. In sociological and polycystudies literature, a *policy* problem is usually defined as a gap between the existing or plausibly expected future situation, and a normatively valued situation; a gap to be bridged by collective or governance activity. Certainly in political or administrative practice, value attribution is part of social conventions, social status, bringing up and educational background, political ideology and group interest. Where moral claims for both sides can be traced to constitutional clauses and public law, policy actors confront the ethical as objectified social construction and group claims.

Presented as numbers and tables in statistical reports and government documents written by scientists or officials, problems and problem descriptions sometimes take on the garb of objectified, merely factual, descriptive statements about a situation. But problems, and especially public problems, are always claims of groups of persons about the way they experience a situation. This makes any attempt to define public problems essentially contested, and thus part of the political process and political conflict. Nevertheless, the fact-value distinction is still justified by invoking the idea that the world of 'values' is created by our own fiat, whereas the world of 'facts' is an indubitable, external given (e.g. Hodgkinson, 1978:104). But epistemologists meanwhile agree that the idea of immediately 'given' sense data as rock-bottom baseline for human knowledge is a misconception. Every form of human observation, and every 'fact' discovered through observation, is inevitably coloured or pre-structured by frequently implicit, hidden theoretical notions (Diesing, 1991; Ziman, 2000). Thus, events and situations that we 'see' and 'experience', are in an indelible way influenced by concepts and mind frames acquired in the course of our life. In the political, administrative and policy sciences such insights have

---

<sup>2</sup> A full theoretical and empirical elaboration of these ideas will appear as a book in the next years: Hoppe, *The Governance of Problems. Puzzling, Powering and Participation in Policy Analysis*.

generated a flood of research into the causal and finalistic (means-goals) assumptions in policy paradigms, heuristics, mind frames, cognitive maps, cultural scripts, and the like (Hoppe, 1999; Fischer, 2003).

Although we should relativize the fact-value distinction from an epistemological point of view, we cannot do away with it in practice. Justifying values, we do appeal to the consent of others in terms of arguments of 'goodness' or 'justice' or 'utility'. In justifying facts, we appeal to the consent of others in terms of 'truth' or 'verisimilitude'. On top of that, in spite of many differences, there exists a fair amount of agreement on the rationality of procedures and methods for convincing an academic or professional community of experts on the truth value of individual propositions and theories. Similar methods or procedures for arguing the superiority of ethical claims or theories are, relatively speaking, less developed, or, at least, more contested (Fischer, 1980; Dunn, 1983).

More importantly, the fact-value distinction has become historically entrenched in institutions of modernity. Particularly, the boundaries between the institutions of science and politics, and between politics and administration, have exactly the fact-value distinction as one of their pillars. In the practical boundary work between representatives of these institutional spheres, the fact-value distinction is continuously appealed to as a basis for demarcation and coordination of activities (Jasanoff, 1990; Halffman, 2003). Ezrahi (1990) has convincingly argued that well into the 1970s objective methods of science were complementary to and actually strengthened the depersonalized authority of democratically elected political leaders and bureaucratically organized civil servants. In other words, the fact-value distinction may be epistemologically suspect and contested, in political, administrative and scientific practice, the sometimes difficult to draw boundary line is continuously constructed on the basis of the fact-value organization of activities, tasks, projects, policy programs, and the like. This does not mean that the boundary is clear, pre-given, and uncontested. On the contrary, boundary work entails almost day-to-day negotiations between representatives of the different institutional spheres to situationally and contingently draw the line (Halffman, 2003). The point is that, in doing so, policy relevant actors appeal to fact-value laden institutional narratives, like bureaucracy and decisionism, to justify their roles and actions. Put more precisely, in the negotiations and consultative mutual cooperation of their day-to-day boundary work, they act 'in the shadow' of bureaucracy and decisionism (Hoppe & Huijs, 2003).

But this is exactly the reason why we may posit that in the social construction of knowledge about policy problems, the fact-value distinction provides the analyst with two socially and politically relevant dimensions for a typology of policy problems. Thus, we may posit that every problem definition is a double social construct.

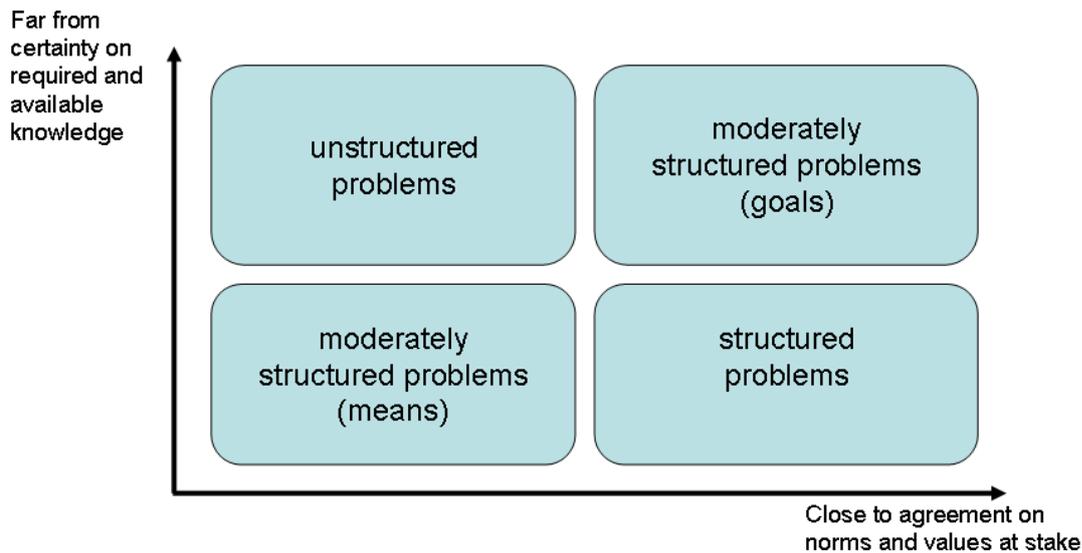
Politicians, administrators, policy and science advisers cannot just arbitrarily compare values and facts and on that basis attribute the label ‘problem’ to the judgment that the facts of a situation do not meet some standard. In order to successfully do this, they have to take into account the distribution of agreement and disagreement in different forums (cf. Watzlawick et al., 1974; Forester, 1982):

- a. degree of consent on (prognosed) facts in all kinds of political, administrative and scientific or professional forums, the media en public opinion;
- b. degree of consent on values at stake, in the same forums, the media en public opinion;
- c. degree of consent on the problem definition itself, i.e., the comparison of fact- and value-sets, in the same forums, the media en public opinion.

Summarizing this section, the elegant simplicity of the concept of ‘problem’ as a gap between a moral or ethical standard and some existing or expected situation cannot conceal its deeply problematic structure. Anyone formulating a problem constructs an easily contestable connection between ontologically disparate elements: moral standards or ethical guidelines (norms, values, principles, ideals), on the one hand, and facts or empirical elements, on the other. Straddling the fact-value distinction, the concept of a ‘problem’ expresses the inextricable entwining of fact-values or value-facts in politics and administrative practice (Forester, 1989:240-241). Add to this the second property of public policy problems: they are social constructs in every respect. Thus, when a politician or policymaker, on behalf of some authoritative political institution or public agency, formulates a problem, and this problem definition gets accepted by a majority of the members of a political community, a very complex and delicate social ‘composition’ has been created. (see **figure 7**)

FIGURE 7 FOUR TYPES OF POLICY PROBLEMS

Figure 2.1. Four types of policy problems



The heart of the typology is the opposed pair of structured versus unstructured problems.

1. *Structured problems*, when policy designers perceive unanimity or near consensus on the normative issues at stake, and are very certain about the validity and applicability of claims to relevant knowledge. They simply know how to turn a problematic present situation into the improved, or desirable, unproblematic future situation. A structured problem is like a puzzle. However complex, the pieces of the puzzle are given, and for each puzzle there is one configuration of pieces representing an adequate solution (Mason & Mitroff, 1981; Dery, 1984). There exists a solution for the problem that, for all practical purposes, is complete and fully guaranteed; usually by means of standardized methods of applied science or professional practice (Rittel & Webber, 1973). Rittel & Webber give as examples ‘tame’ problems of low complexity from the early days of statehood, like building and paving roads, designing and building housing (but see Simon, 1973), eradicating dread diseases (but see Baldwin, 2005), and providing clean water and sanitary sewers. Many (not all) problems of a medical nature fall into this category. Scientific, technical, evidence-based treatment and therapy makes for high levels of certainty on relevant knowledge. Also, there appears to be near unanimous consent on the goals of

medicine: prevention of disease and injury, promotion and maintenance of good health, relief of pain and suffering caused by maladies, care and cure of the sick, care for those who cannot be cured, and avoidance of premature death and pursuit of peaceful death (Callahan, 2003:88-92). It is because of these two properties that the problem definition of structured problems can be kept out of the sphere of subjectivity, politics and overt interest struggle (De Jouvenel, 1963:206-207). Structured problems, thus, usually are matters of administrative implementation and professional routine.

2. *Unstructured problems*, when policy designers observe widespread discomfort with the status quo, yet perceive persistent high uncertainty about relevant knowledge claims, and high preference volatility in mass and elite opinion, or strong, divisive, even community-threatening conflict over the values at stake. Rittel & Webber call such unstructured problems 'wicked', because any solution effort immediately spawns new dissensus and more intense conflict. Unstructured problems are difficult to disentangle or decompose webs of problems. There is dissent and conflict over which pieces belong to the 'puzzle', and over which arrangement of the pieces means 'solving' the puzzle. In the risk societies of late modernity, where the 'distribution of risks' has succeeded the welfare state's 'distribution of goods' as focus of public debate (Beck, 1992), the volume and intensity of unstructured problems appears to be on the rise. Sometimes the negative side effects of entrenched technologies cause a U-turn from structured to unstructured problem. Issues like the car mobility problem (Hoppe & Grin, 2000; Hendriks, 1999), the building of nuclear power plants in the Netherlands, in the 1980's (Hisschemöller, 1993: 71-78), contemporary planning for a nuclear phase-out in Belgium (Laes et al., 2004), and anthropogenic global warming (Petersen, 2006) belong in this category. Sometimes it is the unbridled research and innovation drive that leads to new, unstructured problems. This may manifest itself in new medical technologies like (therapeutic) cloning and xenotransplantation, or breakthroughs in preventive screening through the use of genomics (Callahan, 2003; Hoppe, 2005a). Contrary to structured problems that are almost politically uninteresting, unstructured problems occasionally are in the political spotlight, and may even generate sustained, intractable political controversies (Schön and Rein, 1994).

Using two dichotomized dimensions, there are two in-between, moderately structured problem types; one, where there is considerable substantive agreement on normative aspects, and a second, where there is relatively high certainty on knowledge.

3. *Moderately structured problems (ends)*, when design actors observe a great deal of agreement on the norms, principles, ends and goals of defining a desirable future state; but simultaneously considerable levels of uncertainty about the relevance and/or reliability of knowledge claims about how to bring it about. This kind of problem typically leads to disputes of what kind of research might deliver more certain knowledge for solving the problem. Given uncertain knowledge, and thus uncertain effectiveness and efficiency of interventions, moderately structured problems (ends) also frequently raise issues of bargaining about who will be responsible for expenditures in financing or otherwise enabling certain interventions, and for risks in case of ineffectiveness or negative side effects. Issues like traffic safety (Hoppe, 1996), ambient particulate matter (Petersen, 2006), fighting obesitas (Raad voor de Volksgezondheid en Zorg [RVGZ], 2002) and many issues of policies for routinely agreed-upon socio-economic goals like maximizing GDP and minimizing inflation (Halfman & Hoppe, 2005) belong to this problem type.
4. *Moderately structured problems (means)*, when relevant and required knowledge tends to high levels of certainty, but there is ongoing dissent on the normative claims at stake. The key characteristic of this type of policy problem is not knowledge certainty, but the valuative ambiguity, and frequently the contested and divisive nature of the ethics of the problem. The Dutch debate on abortion provides an excellent example. When the issue arrived at the political agenda, a new, fully safe abortion technique had been introduced. The early debate focussed on the in-principle moral permissibility of abortion; later phases concentrated on the conditions under which abortion might be permissible; and on alternative procedures of consultation for establishing such conditions (Oudshoorn, 1986; Hoppe, 1989). In American political and policy studies the concept of ‘morality policy’ (Mooney, 1999; Smith, 2002) or even ‘sin policy’ (Meier, 1999) has been invented to cover a cluster of moderately structured (means) problems that are generally high on the conservative political agenda, and characterized by an emphasis on fundamental notions of right and wrong, high political salience, and low information costs: abortion, euthanasia or physician-assisted suicide, racism and anti-discrimination policies in general, same-sex marriage, capital punishment, gun control, smoking, family and (criminal) youth policy.<sup>3</sup>

---

<sup>3</sup> In spite of the illustrations given for clarity’s sake, we admit that the four problem types are ideal types in the Weberian sense: simplifying and to some extent even screening out some problem properties in order to bring other aspects (in our case: cognitive and design facets) into sharper relief. For one thing, the typology’s dimensions, normative ambiguity and knowledge certainty, are not inherently dichotomous; consequently, not every policy problem will be unambiguously and ‘objectively’ classifiable as one of the four types. In real-life cases we will encounter hybrid pairings, as will become clear from later examples and case narratives. For

The next step in Hisschemöller & Hoppe's argument is that the political framings of problems or problem types co-evolve with different forms of policy subsystems. In a way, a political system at large is a 'federation of sectors' (Wildavsky, 1980:73); it is 'decomposed' in policy or issue domains. These are components of the political system organized around substantive political problems. Sometimes they are thoroughly institutionalized, like professionalized or technical policy communities and well-delineated policy subsystems; sometimes they are only loosely and temporarily structured, like emergent or disappearing issue networks. It is these politico-administrative structures that effectively couple decision makers to implementors and recipients of rules and services. Policy politics is the specific mode or style of policymaking among the set of political actors, policymakers (frequently policy agencies or organizations), stakeholders, and target groups, involved on a more or less continuous basis, and with more or less intensity in processing a particular public issue or problem. If policymaking is intertwined cogitation and interaction (Wildavsky, 1979), then policy politics is the combination of types of cognitive processes and styles of interaction, characteristic for problem framing and solving in an issue or problem domain.

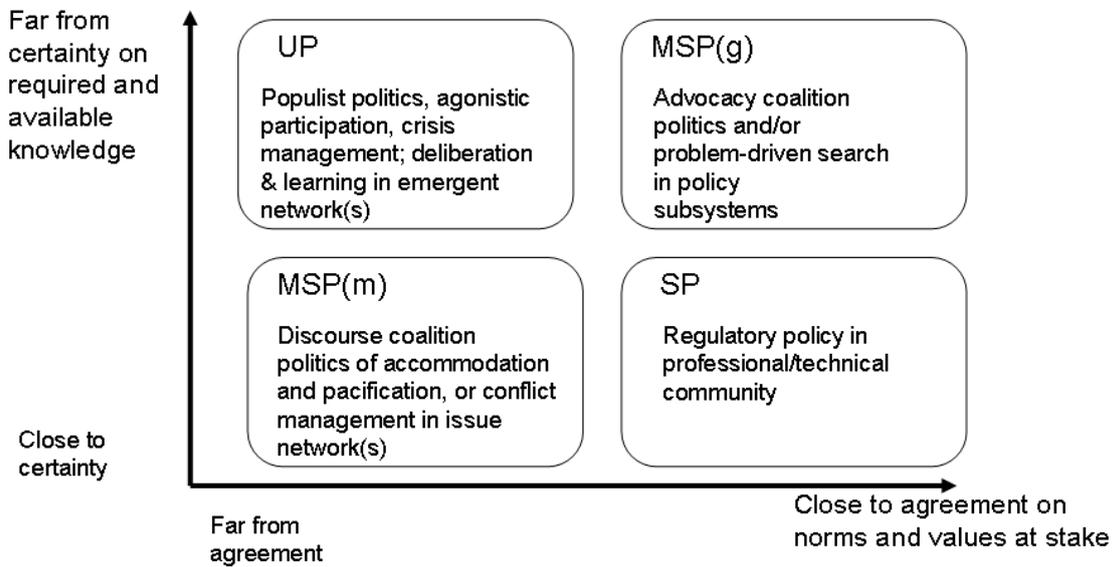
In our type of democratic politics, characterized by competitive and substitutable leadership, societal conflict is exploited by political leaders and their supporting apparatus to win power, or stay in power. It means that the socialization and politicization of conflict is the essential political process in a democracy (Schattschneider, 1960:138). To the extent Lowi was right in claiming that properties of policies – as temporary, but authoritative problem/solution designs – influence properties of politics, one would hypothesize that different problem types typically generate certain modes of problem framing, information search, and decision making. The problem types create, 'behind the backs' of those involved, so to speak, their own modes of governance, types of power arena, and types of political process. In descending order of conflict suppression and avoidance in processes of mutual adjustment: *structured problems* have regulatory politics (*rule*), *moderately structured problems (goals)* have a politics of advocacy coalitions and problemistic search (*negotiation and search*), *moderately structured problems (means)* have a politics of conflict management and discourse coalition building (*accommodation*), and *unstructured problems* are characterized by either populist politics and crisis management, or serious efforts at learning through deliberation (*leadership and/or learning*). (see **figure 8**)

#### FIGURE 8 PROBLEM TYPOLOGY AND POLITICS OF POLICYMAKING

---

another, it will frequently be the case that different policy actors will classify the 'same' problematic situation differently; and that problem types are stable, even for the same policy actor, only for certain periods of time.

Figure 4.2  
Problem typology and politics of policymaking



If we now study figures 6 and 8 simultaneously and imagine some kind of overlay of both, certain ‘family resemblances’ meet the eye. For example, for obvious reasons, in regulatory policymaking on structured policy problems, risk regulators will dominate the policy community; and boundary work between politics/policy and science will be limited to interaction between administrators and technicians. But if we move to moderately structured problems with relatively high value consensus, we hypothesize that in these processes of interest articulation and negotiation the risk imposers will feel quite at home; and, subsequently, a different type of scientific expertise as policy advocacy and consultancy is mobilized in the boundary work with (policy) entrepreneurs. Alternatively, due to remaining ambiguity about the effectiveness, efficiency and side-effects of means, the involved stakeholders may decide on more problem-driven research; in which case they need research experts to do the job. It looks like a particular framing of the policy problem evokes particular questions of uncertainty/risk; and this problem framing acts like a boundary device between policymakers and scientists: the interpretation of the nature of the uncertainties/risks forges coalitions of policymakers and scientists who agree on how to cope with them (Shackley & Wynne, 1996; Hoppe, 2005).

If we now hypothesize that the four problem/process configurations or policy contexts more or less co-vary with step-wise increases in (a) the degree of cognitive uncertainty and value diversity, (b) the amount of role and rule

differentiation in boundary work in the politics/science nexus, and (c) the types of strategies in dealing with uncertainties, we arrive at the following heuristic theoretical structure (see **Figure 9**).

FIGURE 9 Problem types, political and cognitive structure of risk

Problem Type	<b>structured</b>	<b>moderately structured (goal consensus)</b>	<b>moderately structured (means consensus)</b>	<b>unstructured</b>
<b>Type of policy politics</b>	rule in professional policy community	<b>negotiation &amp; search</b> in well-structured network	<b>accomodation</b> through discours-structuration and conflict management in unstable issue network	<b>leadership and/or learning</b> through network construction and destruction in agonistic policy arena
<b>Political structure of risk</b>	risk <b>regulator</b>	risk <b>imposer</b>	risk <b>rejector</b>	risk <b>endurer</b>
	<b>technicians</b> , inspectors, monitors	research specialists, advocacy scientists, <b>consultants, advisors</b>	discursive <b>mediators</b> , concept and value <b>clarifiers</b>	<b>citizen scientists, sensitizing scientists</b> , concept and value clarifiers
	<b>applied science</b>	applied science and <b>professional consultancy</b>	professional consultancy, <b>epistemic debate</b>	<b>post-normal science</b> , and epistemic debate
<b>Cognitive structure of uncertainty</b>	<b>reducing uncertainty</b> of model input through formal and quantitative <b>analysis</b>	<b>bounding uncertainty</b> (action and yield uncertainty) through uncertainty <b>analysis</b> (hedging and validation methods)	<b>uncertainty ‘sifting’</b> (in reducible/irreducible) and <b>uncertainty management</b> (goal uncertainty and model uncertainty about form/adequacy) through qualitative scenarios and triangulation methods	<b>coping</b> with compounded decisional and cognitive uncertainties through <b>robust, resilient and strategic choices</b>

Figure 9, we propose, is the tentative answer to of our last question: how to link the cognitive structure of uncertainty to the political structure of risk. It represents a temporary and provisional heuristic synthesis of the strands of theorizing. It is heuristic in the sense that is open to refinement, but, moreover, that it is a pool of concepts and ideas which allows for the abduction of hypotheses. Proceeding in this way, it is possible to formulate mutually exclusive configurations of conditions under which strategies of dealing with uncertainty can be expected (Yin, 1994).

## 6. Three illustrative cases<sup>4</sup>

Van Asselt (2000) has argued that, usually, it is an error to let one risk perception dominate the way uncertainty in policy problems is dealt with. This too frequently leads to type III errors, i.e. a mismatch between the politically dominant definition of the risk problems and methods used to analyse it. The challenge is to take into account various and variable risk perception. Only by taking a pluralistic view of uncertainty into account, a balanced judgment on risk is possible. In the next four case narratives (*vignettes*, actually), policymakers' different concepts and attitudes will be demonstrated in order to map the ways they deal with uncertainty and decide on risk. Additionally, in the cases we look for evidential support for the idealtypical roles in dealing with uncertainty and risk in the problems involved. Pluralism and idealtypical structure assume that the cases will show two things: all four role structures may occur simultaneously in the same case, but the idealtypical one of them will dominate the others.

### Ionizing radiation: regulate it!

Triggered by the Chernobyl nuclear catastrophe, and informed by new scientific knowledge gained from studying the lives of survivors of the Hiroshima nuclear attack, in the late nineteen-eighties, Dutch MP's amend the decree on ionizing radiation, an important element in the Nuclear Energy Law. This forces government to re-evaluate the protection level of ionizing radiation. All MP's in the Special Committee on Environmental Management agree on improved protection of public health; but they disagree on the necessity of a higher protection level for employees, the environment and public health in general: the new dose limits proposed by the EU's Commission, following scientific advice by the International Commission for Radiation Protection (ICRP), or the substantively higher ones proposed by the Department for the Environment (VROM). A majority in the Special Committee is in favor of the higher dose limits because more stringency aligns well with the general policy approach to external risks (Second Chamber, 1993-94, 21 483, nr. 16: 5-7).

Conservative-liberal MP's, with some support of the Christian-Democrats, have doubts about the VROM-proposal. They question its scientific justification, the effectiveness and efficiency of the VROM dose limits; and, with a view to national economic competitiveness, they ask why the Dutch government should be out-of-step with international developments. They propose a two-pronged alternative. First, the Dutch government should, in principle, concur with policy developments initiated by the EC and ICRP (Second Chamber, 1993-94, 21 483, nr. 16: 2). Second, government should assign the Health Council to compare the pro's and cons of the

---

<sup>4</sup> Section four relies heavily on Huijs, 2003

ICRP and VROM dose limits and give advice accordingly, taking into account only health effects. This latter clause is necessary because the Health Council is a body of medical experts, whose legal jurisdiction is strictly circumscribed to health issues. It is not the first time Conservative-Liberal MP's urge for a Health Council advice on this policy issue. Obviously, they hope to mobilize the Council's scientific authority to back up their political stance to prevent higher dose limits from taking effect for business activities in the Netherlands. But the Health Council effectively wards off the assignment; and the Minister of Environmental Affairs, under political pressure from the EC's following up on the ICRP's science-based advice, decides on the introduction of a 'dual system' of dose limits: respecting the new EU guideline, but simultaneously implement some VROM recommendations.

What one observes in this case is rather typical. Regulatory policy in a settled, well-ordered professional community, dealing with the risks of nuclear radiation along the lines of a well-structured problem definition, is confronted with new political demands, experienced as an intrusion on its field of expertise. More particularly, MP's, with broader (economic) concerns than just (public) health, frame the new policy issue as moderately structured, with considerable political consensus on the policy's goals; although one may fairly assume that they actually disagree on priorities. In order to bolster their bargaining position, they demand a problem-driven study on the comparative merits of dose limit systems by the Health Council, the embodiment of the scientific-professional community regulating health policy issues in the Netherlands. The MP's, in assigning a comparative study on the advantages and disadvantages of different dose limit systems, ask the Health Council not to reduce uncertainty, but to bound the MP's uncertainties as to the yield of the ICPR and VROM alternatives. In effect, MP's put pressure on the government and the Health Council to commit a type III error. But the Health Council refuses a role shift from technical and research experts to consultants and policy advisors on broader issues than health alone. Subsequently, the Minister of Environmental Affairs takes his responsibility and decides the issue on the basis of a political compromise between EC pressure and his own civil servants. Nevertheless, the political decision's practical effect is relatively undisturbed continuation of the institutionalized regulatory regime.

#### The Betuwe-line struggle: right on track?

April 1995 the Dutch government decides to build the Betuwe-line: a freight train-only railway connection between Rotterdam harbor and the German hinterland. The Betuwe-line made it to the political agenda in the 1980s without any study of alternatives (Roscam Abbing, 1999). The policy formulation process is a classic case

of premature fixation on one particular problem/solution coupling: a freight-only-trains railway as a solution to the potential transport problems for Rotterdam as expansive world harbor area, and its attendant economic risks (Hoppe & Huijs, 2002). Political parties, except the Conservative-Liberals (VVD), are swayed by a vocal and powerful business lobby that emphasized the Dutch Randstad area's vital economic function as 'Europe's delta'. In public policymaking, there is not even the beginning of an open and pluralist debate on alternative problem structurings. Apart from the effective business lobby, premature problem closure is caused by many concomitant political factors inherent in the Dutch political system of cartel democracy and coalition government: the Minister for Traffic, Transport and Waterways and her bureaucratic staff have strong Rotterdam connections and incorporate the Betuwe-line proposal in policy documents with high political salience; they even manage to write the proposal into the Declaration of Government that marks the four-year period of a new government coalition, which means that any dissenting MP's in coalition parties risk a cabinet crisis if they press their claims too hard; MP's Special Committees, with a structure that parallels bureaucratic departments, can raise only small, instrumental issues, and generally lack the political courage to acknowledge that one had better stop half way than persevere in error. One more important cause is that policy formulation is entrusted to railway engineers (at the time) in the Department of Traffic, Transport and Waterways; and they enthusiastically exploit this opportunity in technocratic ways (Hoppe & Huijs, 2002).

By pre-structuring the policy problem, the Dutch Railways, the Department, supported by a coalition cabinet and a majority of MP's delegitimizes any criticism of the project. Only after, in February 1992, special political decisions have been taken on citizen participation, society-wide debate on the 'utility and necessity' of the Betuwe-line project seriously commences. Until then, regional and local administrators and civic action groups, anticipating the adverse consequences, had no structured way of voicing their objections against the risk imposers. As risk rejectors, they join hands by hiring relatively cheap university scientists for counter-argumentative ammunition against the government proposals. To cover itself against criticism, prime minister Lubbers himself urges cost-benefit analysis to help settle the political 'usefulness and necessity' debate. Surprisingly, government does not turn to its tried-and-tested knowledge institutes and advisory bodies, like the Center for Economic Policy Analysis, or some prestigious economic faculty. They outsource the cost-benefit studies to private consultancy organizations like Knight Wendling, McKinsey, Nyfer and Twijnstra & Gudde. Partly on the basis of their studies, an ad-hoc governmental commission, chaired by a prominent Conservative-Liberal ex-MP, after a formal quality control of several cost-benefit studies with contradictory outcomes, convinces the Conservative-Liberal MP's of the project's economic viability. They give up their opposition, and

henceforth support the government plans. Yet, the frequently local mobilization of counter-expertise, and the lobbying of MP's by the risk rejectors – frequently a coalition of regional or local administrators and civic action group representatives-- has some political impact. The traffic noise pollution exemption for Betuwe-line projects for 70 dB(A) is lowered to 65 dB(A); more expensive new technologies are used to minimize adverse ecological side-effects; a score of local adaptation are implemented for the same reason. All in all, €4 billion of public, taxpayers' money is added to the original bill for the Betuwe-line (Pestman, 1999).

What we observe here is a government easily swayed by a risk imposer – Rotterdam entrepreneurs and harbor authorities – to adopt a policy problem framing that, technically, is a moderately structured problem with goal consensus. However, by premature problem definition closure, the government also turned over the problem to railway engineers as technicians. Using a decide-announce-defend political strategy, they committed a type III error by entrusting design and implementation of the plan to railway technocrats. Forced to bargain anyway, they outsourced studies on major economic issues to private consultants and an ad-hoc advisory commission (named after its chairmen, the prominent Conservative-Liberal politician, Hermans), composed of prominent politicians, administrators and an odd scientist. Politically, this sufficed to save the Betuwe-line project. Action uncertainty was effectively bounded; the freight-train-only connection was never seriously compared to alternatives like trucking and inland shipping. But the veto- and nuisance-power of regional and local governments, in coalition with civic action groups, had some success in adapting the railway engineers' plans to ecological and human habitat concerns. In their effort to bound yield uncertainty and risks of the original plans, the risk rejectors drew support from university professors acting as consultants and private consultancy organizations.

#### Gun control in the US: it is cultural, stupid!

The American gun control issue is a clear case of competing risk perceptions. Proponents of '*gun safety*' fear the risk that citizens become easy victims of deliberate or accidental shooting; therefore they advocate government regulation of gun sales, gun ownership and gun use. Opponents emphasize the opposite risk, that too much government intervention will leave citizens unable to defend themselves against criminals and other malevolent people; and therefore argue the case of '*gun rights*'. For the neutral observer, here is a clearly unstructured policy problem. On the values-at-stake side, there rages an incessant paradigm battle, in which the dangerous versus protective quality of guns, and the positive versus negative role of government intervention remain as divisive an issue as ever, both among gun scholars, advocacy groups, and the public at large (Nathanson, 1999;

Kahan and Braman, 2003a). In 1995, William J. Vizzard (1995), a long time policy analyst and civil servant in federal gun control policymaking, analyzed it is a classical example of garbage-can-like policymaking processes. Only after focal events like presidential assassinations, ‘cop killer bullets’, or another high school massacre, for brief periods of time, policy windows open up for government regulatory policy. And although there were numerous initiatives, almost none of them survived the stage of practical implementation. Vizzard (1995:346) blames the policy stalemate on disinterestedness of legislators, and risk avoidance of bureaucratic staff:

“The crafting of effective public policy, absent great luck, requires significant grasp of...such issues as the mechanics of the firearms market, the role of firearms in social behavior, and options for firearms control...Legislative staffs have spent minimal time mastering such mundane issues, because legislators show little interest....(T)he bureaucracy has followed the safest course of action and avoided association with significant proposal for policy change.”

Evidently, attempts to deal with the gun control issue as if it were a readily structurable problem, its risks to be regulated in routine interaction between risk administrators and risk analysts, have sadly misfired. How about the role of scientists? Proponents and antagonists in the gun control issue have never enjoyed scientific and professional consensus on ‘gun scholarship’, reflected in a highly divided and divisive public opinion. Here one observes representatives from different disciplines trying to structure the problem along well-known, but different paradigmatic lines. Economists, assuming that citizens in real life also act on some approximation of a rational choice model, try to adduce as much measurable information on the cost and benefit side of gun control or its opposite; hoping to influence public opinion through facts and statistics in cost-benefit analyses (Fremling and Lott, 2003). Similarly, the medical professional community tries to ‘medicalize’ the problem by bringing to bear more compelling and detailed comparative analysis of the risk of firearm injuries (not just crime-related shootings and killings, but also suicides or incidents with children), grounded in evidence and guided by data (Selzer, 2002). Modestly limiting themselves to cost-effectiveness analysis, policy analysts also try hard to present information on what policy instruments and implementation strategies work and don’t work, and at what cost (Cook and Ludwig, 2003). International relations students draw an analogy with the Cold War, viewing the gun control issue as a sort of arms race; advocating ‘containment’ as a more realistic strategy than a total gun ban; ‘nonproliferation’ is the right strategy for new weapons, and ‘arms control’ for existing weapons (Spitzer, 1995).

Commenting on Spitzer’s remark that “(t)he gun policy struggle is one where elephantine political forces battle over policy mice”, Mike Matthes (1995:561) points out the weakness of all approaches: why would the elephants

begin to share? None of the conventional approaches is able to state how the political deadlock will change through adducing new factual evidence or another imaginative analogy for policy design.

Braman & Kahan (2003a, 2003b; Kahan & Braman, 2005) convincingly argue that a consequentialist type of policy discourse, that relies on cost-benefit, cost-effectiveness or comparative risk information alone to change public opinion and beliefs by proximate policymakers and political leaders, will never work. Awareness and perception of risks is not a matter of perfect information and correct public understanding of science; it is rather the reflection of diverse social meanings citizens attach to particular hazards; it is a matter of what type of society citizens dream of. Not discussing ethics and worldviews, means either public silence on issues like gun control, or unproductive battle over one another's integrity and honesty in accepting an 'indisputable, objective truth'. Instead, Braman and Kahan want scientists to devote their skills to developing a pluralistic expressive policy idiom that enables overlapping dissensus. What is needed is open and frank debate on the competing worldviews and ethics underlying different position in the gun control debate (Kahan & Braman, 2003b:1413-4):

“...we anticipate that progress on the gun debate will be made only when citizens express the specific and divergent meanings that obtain for them ... Working these divergent meanings into law and policy, we think, is the key to...legitimate decision making.”

Kahan & Braman's alternative approach illustrates the remaining elements in our theoretical scheme. They want to break out of the gun control issue as unstructured policy problem in a highly volatile and agonistic policy arena. They have enough of the citizen scientists or sensitizing scientists posing as specialists in cost-benefit, cost-effectiveness and comparative risk analysis. They transform an unstructured problem into a moderately structured problem, whose instrumental aspects have to be bracketed first; to be reintroduced only later, when some pluralistic expressive policy discourse has been invented. Epistemic debate should have priority (Kahan & Braman, 2003a:30):

“The only philosophically (and practically, rh) cogent way to resolve the gun control controversy is to address explicitly...the question of what stance the law should take toward the competing cultural visions that animate the gun control debate.”

They plea for scientists to play the role of mediators, concept and value clarifiers, in an accommodation strategy. Only after such a new policy vocabulary has become available, citizens will be able to pay serious attention to factual information on what works or does not work, that will result from scientific methods of uncertainty sifting and management. In that sense, instrumental policy-oriented learning is preceded by valuative learning.

## **7. Implications for guidelines in risk scholarship**

The three case narratives, despite their brevity and perhaps superficiality, have indicated some empirical support for the idealtypical connections between politically framed problem types, types of policy politics in policy networks, and the political structure of risk and cognitive structure of uncertainty. More particularly, the framing dynamics in a policy network lead politicians and policy staffers to frame the policy problem in a particular way; and it is this framing that acts like a filter for scientific risk roles down the line; it activates one or another form of boundary work between politics and science, activates scientists in particular risk roles; selects particular scientific disciplines as relevant, and thereby triggers particular methods of dealing with uncertainty. Perhaps the most important implication is that modes of risk analysis are just one item in a politician's shopping list for political and governance venues in issue framing, agendasetting and decisionmaking. He may use risk analysis, or not; use one particular mode, but not other modes; get rid of a mode of risk analysis that does not please him, and initiate another mode (Hoppe & Peterse, 1993).

If the political framing of policy problems as one of the four problem types is so important, can we say anything useful on politicians' inclinations or propensities in this respect? Like all human beings, politicians and policymakers act under conditions of bounded rationality. This implies that they are cognitive misers in complex social-institutional contexts. They want maximum intellectual results from minimal cognitive efforts in a particular task environment. Psychologist Philip E. Tetlock (1997:660-661) gives an excellent summary description of the socially constructed task environment of political and public life in his two core assumptions: (1) "accountability of conduct as a universal feature of the natural decision environment", as the most important link between individual policymakers and the social-political environments in which they typically act; and (2) people act as approval-and-status seekers, keen on protecting and enhancing their self-esteem, their social image and identity, while acquiring power and wealth.

From our basic assumptions we derive the expectation that governmental policymakers' and decisionmakers' in principle prefer to define 'their' problems as structured. Doing so minimizes their uncertainty, limits the need for search activities, and constrains the range of alternative solutions to existing repertoires. One might say that politicians, paradoxically, prefer 'delegated technocracy' as favorite problem solving strategy. Furthermore, we hypothesize that when there is too much complexity or social conflict, they will continue trying to minimize 'trouble'. Therefore, they will prefer to identify these politically more sensitive situations as one of the two classes of moderately structured problems. They would rather not admit to themselves and others that they have fully unstructured problems on their hands. This implies that governmental policymakers will show a marked

tendency to ignore, sometimes actively screen out, information that may complicate the policy problem under scrutiny. This tendency need not be deliberate, or even acknowledged. Policymakers may be completely unaware of their screening relevant information away from the policy arena, since they may not consciously grasp the biases that are inherent in their own policy frames.

Another reason for problem framing bias or sheer neglect is that policymakers implicitly decide on values *at stake* and knowledge *relevant* and *required* for problem solving. This implies that when finding and choosing a problem frame, policymakers inherently choose a ‘legitimate’ problem space and a political discourse to discuss it. That is, they determine, tacitly or deliberately, what can and cannot, may and may not be said about the problem without being labelled as transgressing politically ‘correct’ boundaries or rules of the political language game. In the case of gaps between problem understanding of official policymakers or policymaking bodies and other influential policy actors, or the public at large, they run the risk of tackling what is called the ‘wrong problem’. They may treat as ‘structured’ a problem that other stakeholders – be they peak associations, pressure groups, target populations, science advisors, risk analysts, or even their own executive managers and street-level bureaucrats – experience and define as much more complex and controversial than they are willing to admit. It is exactly at this point where, if they go unacknowledged, unattended to, or denied for too long, intractable policy struggles occur.

There is one final analytical point to be made. The social and political distribution of political and policy actors’ problem frames, through a combination of path dependent institutionalization processes and normal political strategizing in agenda setting, policy design and adoption, and evaluative feedback, results in the political selection of a temporarily stable, dominant problem frame for governmental policy. This opens the possibility of a structural and temporal mismatch between the effectively dominant governmental problem definition, and alternative problem framings alive among other groups in society. Using a mathematical and statistical metaphor, some authors call this a *Type III error* (Raiffa, 1968: 264; cf. Mason & Mitroff, 1981; and Dunn, 2004: 85-86):

“One of the most popular paradigms in mathematics describes the case in which a researcher has either to accept or reject a null hypothesis. In a first course in statistics the student learns that he must constantly balance between making an error of the first kind (that is, rejecting the null hypothesis when it is true) and an error of the second kind (that is, accepting the null hypothesis when it is false)... practitioners all too often make errors of a third kind: solving the wrong problem.”

This idea is of utmost importance. After all, distinguishing between types of policy problems by the way they are cognitively framed is meant to improve our political understanding of structural mechanisms and agential strategies that either contribute to or hamper the solution, resolution, or control of particular societal problems through collective action. For now, it suffices acknowledge that due to strongly divergent problem decompositions among groups of policy actors, and hard to correct path dependencies and institutionally entrenched beliefs, attitudes and routine practices, Type III errors or ill-structured problems do occur in politics and public policy. When they are present, they trigger or fuel controversy and deadlocks. But here we only stress how the concept of error of the third type or *ill-structured* problem will be used. It is a heuristically sensitizing concept for cases where political or administrative institutions with the authority and power to define and delineate a problem space (a) consider a problem structured where it should instead have more plausibly been defined as moderately structured, or (b) where it is defined as moderately structured when it actually is completely unstructured, or should be more plausibly defined as moderately structured problem of a different kind. Policy designers and those who politically adopt such designs as official policy erroneously assume sufficient agreement on values at stake, or sufficient amounts of certainty on relevant knowledge claims. This definition is consistent with the criteria used to define the four problem types. We emphasize that every policy-relevant choice for a particular problem definition, as well as the judgment that a problem is ill-structured, should be well argued. After all, there are no objective criteria for ‘good’ or ‘bad’ problem choice.

Let us now briefly turn to risk scholarship; in particular, the tendency to formulate and reformulate guidelines of ‘good practice’. Criteria for good practice and their standardization in guidelines are normal self-regulating strategies for survival and improvement for any professional community. Guidelines enable leaders of the profession to impose quality standards on other members; in so doing, they also contribute to a uniform image or transparency of what the profession is doing and can do; which may ward off intrusions from neighboring professions, and improve the professions’ status in the eyes of its clients. The risk profession’s will to transparency through better guidelines in principle fits the cognitive inclinations of politicians and policymakers. Even though professional guidelines may not lead to the same simplifying biases that drive politicians’ problem or risk perceptions, they contribute to the politicians’ sense of what a profession’s political utility is. Also, to the extent the profession’s will to transparency actually manifests itself in guidelines that constrain practice and make it more uniform, a potential implication is that professional guidelines contribute to Type III errors as structural mismatches between political problem framings and professional methods for problem solving.

Politicians may be aware of this; in which case they will not appeal for help of the profession in solving a problem outside its set of methods. But it must be feared that sometimes professional guidelines contribute both to a sense of transparency in the eyes of politicians, and, simultaneously, the frequency of Type III errors.

The practical implication for guidelines in risk scholarship is that the political nature of the activity has to be reflexively acknowledged. This means, first, that mapping the political context for its distribution of problem framings among relevant policy actors is the first analytic activity to engage in. It means, second, that any system of guidelines will have to assume pluralistic risk perceptions. And third, that any system of guidelines will have a structure of contingency: if the policy problem is framed as A, then scientific risk role M,N, and P will be appropriate; and methods for uncertainty and risk analysis X, Y and Z may be fitting. If, however, the policy problem is framed B, then.... If a system of guidelines for risk scholarship can be devised that respects these three criteria, risks for committing Type III errors are minimized. But not eliminated. For we also acknowledge that sometimes Type III errors are not 'mistakes' in the intellectual sense of the word. They may occur due to what has been called the 'rationality of power' (Flyvbjerg, 1998:225-236). More precisely, those in possession of control over the means of rationality – scientists, policy advisers, policy analysts, risk analysts, and such – may be able to describe, interpret, and analyze the multiple ways in which other politically and policy relevant parties frame a problem. But those who actually control the means of power, may unilaterally define 'reality', i.e. they have the power to decide that a particular problem will be treated as if it were of a certain problem type. In doing so, they also decide on the types of cognitive instruments or methods, and the types of science/politics interactions to be used in 'solving' the problem. In other words still, those in power, deliberately or in their own blindness, define what counts as 'rationality' and knowledge. The relationship between power and rationality in problem framing is asymmetrical (Flyvbjerg, 1998:234):

“...power has a rationality that rationality does not know. Rationality, on the other hand, does not have a power that that power does not know.”

The rationality of power is one more reason to be skeptical about the real impact of improved guidelines for risk scholarship in public policymaking. Transparency and reflexivity are perhaps necessary, but not sufficient conditions for improved political practice. To change the 'Realpolitik' of risk problems, political accountability structures will have to be enlarged by incorporating new checks and balances in the policymaking and political decision-making process. We do not only need stakeholder and citizen participation in analytic methods of risk analysis and assessment. We need more accountability to stakeholders and citizens in political will formation procedures for taking legitimate political decisions on risk.

## References (to be completed!)

- Beck, U., *Risk Society*, Sage, Thousand Oaks, 1992
- Bovens, M. & P. 't Hart, *Understanding Policy. Fiascoes*, Transaction Books, New Brunswick NJ, 1996
- Braybrooke, David, L. and Charles, E. Lindblom, *A Strategy of Decision. Policy Evaluation as a Social Process*, New York: Free Press, 1963
- Callahan, D., *What price better health? Hazards of the research imperative*, University of California Press and the Milbank Memorial Fund, Berkeley and New York
- Douglas, M., *Natural Symbols. Explorations in Cosmology*, Pantheon Books, New York, 1970
- Douglas, M., *How Institutions Think*, Syracuse UP, Syracuse NY, 1986
- Douglas, M. & A. Wildavsky, *Risk an Culture*, University of California Press, Berkeley, 1982
- Eeten, van, M., *Dialogues between the Deaf*, Eburon, Delft, 1999
- Flyvbjerg, B., N. Bruzelius, and W. Rothengatter, *Megaprojects and Risk. An Anatomy of Ambition*, Cambridge University Press, Cambridge
- Funtowicz, S. & J.R. Ravetz, *Uncertainty and Quality in Science for Policy*, Kluwer, Dordrecht, 1990
- Funtowicz, S. & J.R. Ravetz, 'Three types of risk assessment and the emergence of post-normal science', in S. Krimsky & D. Golding (eds.), *Social Theories of Risk*, Praeger, Westport, 1994
- Hisschemöller, M. & R. Hoppe, 'Coping with Intractable Controversies: The Case for Problem Structuring in Policy Design and Analysis', in *Knowledge and Policy. The International Journal of Knowledge Transfer and Utilization*, Winter 1995-96, 8, 4, pp. 40-60
- Hisschemöller, M., R. Hoppe e.a., *Effectieve kennisbenutting en politieke keuze: een dilemma in milieubeleid?*, Rathenau Instituut, Werkdocument 65, Den Haag, 1998
- Hisschemoller, M., R. Hoppe, W.N. Dunn, and J.R. Ravetz (eds.), *Effective Knowledge Use, Power, and Participation in Environmental Policy*, Transaction Books, New Brunswick, N.J., 2001
- Hisschemöller, M., R. Hoppe, P. Groenewegen and C.J.H. Midden, Knowledge Use and Political Choice in Dutch Environmental Policy: A Problem-Structuring Perspective on Real Life Experiments in Extended Peer Review, in Hisschemöller et al. (eds.), 2001, 437-470
- Hogwood, Brian W., and Lewis A. Gunn, *Policy Analysis for the Real World*, Oxford: Oxford University Press, 1984
- Hoppe, R. and A. Peterse, *Handling Frozen Fire. Political Culture and Risk Management*, Westview Press, Boulder CO, 1993
- Hoppe, R., 'De politieke consequenties van ecologische zekerheid', in: P. de Jong (red.), *Wisselwerking tussen waarden. Een uitdaging voor het openbaar bestuur*, Geschriften van de Vereniging voor Bestuurskunde, Congrespublicatie 1997, Elsevier, Den Haag, 1998, pp. 43-60
- Hoppe, R., *Van flipperkast naar grensverkeer. Veranderende visies op de relatie tussen wetenschap en beleid*, Adviesraad voor Wetenschaps- en Technologiebeleid, Achtergrondstudie 25, Rotterdam, 2002
- Jasanoff, S., *The Fifth Branch. Science Advisers as Policymakers*, Harvard UP, Cambridge, Massachusetts, 1990
- Jelsma, J., 'Frame-reflective policy analysis in practice: co-evolution of a policy regime and an intractable controversy in biotechnology', in: Hisschemoller, M., R. Hoppe et al. (eds.), forthcoming
- Palmlund, I., 'Social drama and riskevaluation', in: Krimsky, S. and D. Golding (eds.), *Social Theories of Risk*, Praeger Publishers, Westport, 215-229
- Ravetz, J.R., 'Models of Risk: An Exploration', in: Hisschemöller, M., R. Hoppe et al. (eds.), 471-492
- Rip, A., 'A cognitive approach to relevance of science', in *Social Science Information*, Sage, London, 1997, 615-640
- Schomberg, von, R. *Argumentatie in de context van een wetenschappelijke controverse. en analyse van de discussie over de introductie van genetisch gemodificeerde organismen in het milieu*, proefschrift Universiteit Twente, WMW Publicatie 27, Enschede, 1997
- Shackley, S. and B. Wynne). "Representing Uncertainty in Global Climate Change Science Policy: Boundary-Ordering Devices and Authority." *Science, Technology, and Human Values*, 1996, **21**(3): 275-302.
- Sluys, van der, J.P., en K. Schulte Fishedick, 'Omgaan met onzekerheden in weten-

schap voor (milieu)beleid: een inventarisatie van theorieën en aanpakken', Universiteit Utrecht, in opdracht van het Rathenau Instituut, rapport 97017, april 1997.

Sluys, van der, J.P., *Anchoring amid uncertainty. On the Management of uncertainties in risk assessment of anthropogenic climate change*, proefschrift Universiteit Utrecht, 1997

Van Asselt, M., *Perspectives on Uncertainty and Risk. The PRIMA approach to Decision Support*, Kluwer, Dordrecht, 2000

Vermeulen, W.J. e.a., *Duurzaamheid als uitdaging*, WRR, V 101, SDU, Den Haag, 1997

Weinberg, A.M., 'Science and Trans-science', in *Minerva*, 33, 1972, pp. 209-222

Woodhouse, E.J., & D. Nieuwma, 'Democratic expertise: integrating knowledge, power, and participation', in Hisschemoller, M., R. Hoppe et al. (eds.), 2001, 73-96

WRR, *Duurzame Risico's*, SDU, 's-Gravenhage, 1994

Yin, R.K., *Case Study Research. Design and Methods*, Sage, Thousand Oaks, 1994 (2<sup>nd</sup> ed.)