

SPIRE

Science and
Precaution in
Interactive Risk
Evaluation

Intermediary
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1. INTRODUCTION

1.1. CONTEXT AND SUMMARY

In late-modern societies new scientific and technological applications often provoke risks. Some of these risks are well-known, others are not. The latter kinds of risks are characterized by many - fact-related as well as value-related – uncertainties. Therefore, they can be classified as ‘unstructured’ problems. Various risks, moreover, imply a threat to the ideal of Sustainable Development, because the negative effects they possibly induce are irreversible and can, together with other negative effects, have cumulative and synergetic effects.

The ideal of Sustainable Development invites us to reconsider the role of scientific and technological knowledge with respect to the evaluation and management of technological risks. This reconsideration is needed in both the public and the private context. We should reinvestigate the role and functioning of scientific advisory councils within a context of both public policy and private enterprises. Therefore, the research question that is put forward in this project proposal is the following: how can scientific knowledge be appropriately applied to resolve complex and unstructured problems concerning the evaluation and management of technological risks? The inherent uncertainties of complex and unstructured problems prompt us to take the Precautionary Principle as a normative starting point.

1.2. OBJECTIVES

The aim of our research project is to develop guidelines for the organization of the process of scientific advising. The project intends to contribute to practical procedures and methods in relation to risk evaluation and management that are both scientific and precautionary. This implies that we challenge the often raised contrast between science and precaution.

The research project is split up into two parts:

- Implementation of the Precautionary Principle in scientific councils advising public authorities: this part of the research focuses on the interactions between academic scientists, scientists within civil services and political representatives (STEM focus).
- Consequences of the implementation of the Precautionary Principle by public policy for companies: this part of the research focuses a) on the interactions between privately funded experts (experts internal and external to the enterprise in question) and the private enterprise and b) on the interactions between privately and publicly funded experts (experts of relevant civil services) (FTU focus).

1.3. EXPECTED OUTCOMES

The project will yield three types of results:

1.3.1. THEORETICALLY DERIVED PRECAUTIONARY GUIDELINES

Several topics will be the object of a literature study: the conceptual, legal and judicial history of the Precautionary Principle, resemblances and differences between prevention

and precaution, ethical theories founding the Precautionary Principle, Precautionary approaches, the nature of scientific knowledge, characteristics of Risk Societies, the meaning of trust in democratic institutions, models of interaction between science and policy. Out of the results of this literature study we will derive preliminary guidelines for the organization of processes of scientific advising.

1.3.2. EMPIRICALLY GATHERED PRECAUTIONARY PRACTICES

Each research team will analyse cases (some concerning the relationship between scientific advisory committees and public authorities and some concerning the relationship between private experts, public experts and private enterprises). The aim of these case studies is:

- to investigate the practical implementation of the Precautionary Principle in scientific advisory councils in a public as well as private context;
- to make an inventory of bottlenecks concerning the translation of the Precautionary Principle in processes of scientific advising in both contexts;
- to construct together with the various actors concerned feasible and commonly acceptable solutions to these bottlenecks.

1.3.3. A GUIDE WITH PRACTICAL SUGGESTIONS FOR PRECAUTIONARY SCIENTIFIC PROCEDURES BOTH WITHIN A PRIVATE AND PUBLIC CONTEXT

The final product of our research project is a guide with suggestions for a precautionary use of scientific knowledge concerning technological applications and their possible risks. This guide can help public authorities and private enterprises to make a critical assessment of their own current procedures. The guide will consist of:

- a list of bottlenecks in the interactions between scientists and public authorities on the one hand and between private or public scientists and private enterprises on the other;
- a list of preconditions and criteria for precautionary scientific advisory processes;
- a list of possible and suitable procedures and tools.

2. INTERMEDIARY RESULTS

2.1. THEORETICAL FRAMEWORK

2.1.1. RISK SOCIETY

Industrial societies of the beginning of the 21st century are complex societies. In 1986 sociologist Ulrich Beck introduced the concept Risk Society to describe them. Typical for late-modern industrial societies is the frequent occurrence of risks. Environmental and health risks nearly systematically accompany new scientific and technological applications. We cannot any longer regard such risks as exceptions, excesses or manageable negative side-effects of a far advanced process of industrialisation. Moreover, these risks are far reaching. The reverse of late-modern scientific and technological success is a fragile world: we are able to destroy the whole planet earth, to influence biodiversity thoroughly, to make a proper mess of climate. The conclusion that risks are more frequent and more intense than ever before urged Beck to make mention of a new type of society: risk society.

Many risks in a risk society are of a new type. They are not directly observable through the senses. They are of a collective nature: nobody can adequately shield from them. They are irreversible and extend in time and place. They are pre-eminently complex. Consequently, scientific and technological experts find themselves in an ambiguous position. Scientific and technological experts are both the originators of possibly huge harm and at the same time risk societies need their expertise to detect harm and to look for possible solutions. At the same time scientists are not able to respond adequately to the uncertainties characterizing these new risks. Firm scientific foundations are lacking: knowledge gaps exist and/or scientists find themselves at odds with each other.

Next to scientifically induced risks, late-modern societies are characterized by social risks. Two trends can explain these social risks: individualization and detraditionalization. The traditional authority of church, (extended) family, political parties and science vanished. In the past they provided for a relative predictable future. The introduction of the welfare state, however, allowed citizens to delineate their private life plan, to free themselves from tradition and to draft their own biography. For many people, this freedom became an obligation. Citizens have to invent their own responses and to make private choices to organize both their private and their public lives. They are continuously confronted with new challenges and new (social) risks.

According to Beck and Giddens risk societies are the product of an extreme process of modernization. Extreme modernization ends in what Beck calls ‘reflexive modernisation’; Giddens prefers the concept of ‘institutional reflexivity’. The concept of ‘reflexivity’ helps to interpret the institutional problems of a risk society.

The concept of reflexivity refers to a radical transformation of industrial societies (Beck *et al* 1994, 2-13). This transformation is not intended nor planned. It happens unnoticed and is induced by the same forces and institutions that set up industrial society.

Beck distinguishes two stages in this process of reflexive modernization. In the first stage the current institutions of industrial societies systematically produce negative effects and threats, without them to become the object of public debate or political conflict. The notion of an industrial society still prevails. This notion allows that risks and threats become more frequent and are understood as side-effects. This stage is the stage of a

‘residual risk society’. The second stage starts as soon as the dangers of an industrial society become dominant topics of political, public and private conflicts and debates. The conviction that some characteristics of industrial societies are not acceptable gets firm ground. At the one hand societies continue to take their usual course. On the other hand the many conflicts provoke a questioning of the judicial system and of public policy. At the same time awareness grows that current industrial societies are not capable of managing existing dangers.

Beck distinguishes between these two stages in order to stress that the concept of reflexivity does not refer in the first place to a cognitive process. The concept refers in the first place to the fact that inherent dangers and threats of industrial societies confront modern institutions with themselves. Modern institutions bump into their own limits. This self-confrontation implies that it is impossible to manage these effects from within existing institutions.

The concept of risk society questions, among other things, the institutions of science and politics. Trust in scientific knowledge and in societal applications thereof gradually got affected. Modern sciences that are a driving force in industrial societies bump into the limits of their own success. They not only generate products and processes. At the same time they bring about all kinds of risks and accidents. Scientific progress does not any longer automatically stand for societal progress. In short, public trust in the ethical quality of scientific applications is unsettled.

Scientists’ inability to provide certain knowledge further undermines the traditional authority of science. The more complex is the research domain and the longer is the interval of time of predictions required for, the more difficult it is to supply risk analyses that are reliable and acceptable for various parties concerned. Boundaries between scientifically founded predictions, informed guess, prophecy and scientific fantasy become blurred.

This fading trust in science and technology puts political authorities in a difficult situation. People expect them to manage risks and uncertainties adequately. Who defines, however, which actions are adequate. Since scientists are not able to provide public authorities with unambiguous answers, final decisions will be of a political nature (Von Schomberg 1997). But politicians and their civil servants cannot do without the assistance of scientific and technological experts. This instrumental appeal on experts will however confront them with dissenting opinions of other societal actors that make an appeal to their own scientific and technological experts. Finally the political reflex to call on the authority of science turns out to be noxious to both science and politics. ‘Science loses its authority because it speaks with different voices. It cannot relieve political debates, but it constitutes a strategic source of which one has to dispose inevitably’ (Von Schomberg 1997, 136).

2.1.2. THE PRECAUTIONARY PRINCIPLE

Definition

Since the Stockholm Conference for the Environment in 1972 the concept ‘Precaution’ can be found in many national and international policy texts, texts regarding pollution of the seas, climate change, loss of biodiversity, dangerous chemicals and introductions of genetically modified organisms. An influential description of this principle is the one mentioned in the Rio Declaration on Environment and Development (1992): ‘Where there are threats of serious irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation’.

The Precautionary Principle is meant to (legitimize and) orient public action in case of scientific and societal uncertainties, i.e. when societal controversies exist regarding relevant values and scientific disputes concerning relevant facts and perspectives.

Precaution and Sustainable Development

The Precautionary Principle has a policy history of about 30 years. According to O’Riordan this history shows a shift in the meaning of the Principle. While the Principle originally got its meaning in a debate and policy context of environmentalism, the Principle nowadays is reinterpreted from the perspective of sustainability (O’Riordan *et al.* 2001, 13-19)¹.

The distinction between these two themes is important. Environmentalism is a political and technological philosophy relating to how society looks at the robustness or fragility of nature, and what level of confidence it has in management and technical resources to continue to grow yet maintain the life-support functions of nature. Environmentalism has become rooted in modern political cultures as a factor stimulating much innovative regulation and new styles of citizen participation.

Sustainability is quite a different concept. ‘Here the social dimension of human rights, fairness, justice and capability to be empowered, enters along with all the political ramifications of attending to “minorities” and “victims”. In addition, the application of sustainability relates to political partnerships, to middle term planning (i.e. beyond the electoral life of legislatures) and to much more integration approaches to policy and management. Above all, sustainability applies to the maintenance of life support from within its own capabilities, the protection of social trust and connectedness, or their restoration when these have been damaged, and the emergence of an economy guided by natural principles, linking global processes to local autonomy’ (O’Riordan *et al.* 2001, 14).

In a context of sustainability the meaning of the Precautionary Principle thus slightly shifts. The competence to be “civic” – to organise itself into self-supportive groupings of creative order, constructive participation, and supportive democracy in the face of dispute – has begun to take on a new meaning. It is not just about connectedness or integration. It is about using these attributes of support, self belief and partnership collaboration to create communities that can co-exist within the “edges” of biogeochemical limitations. All this provides a very different framework for participation than commonly attempted in planning. For the interpretation of the precautionary principle, the transition to sustainability means that far more attention will be given to possible consequences for future generations, who do not have a formal legal voice, as well as to present generation vulnerable peoples, who do not have a political voice.

On the other hand, Sustainable Development cannot neglect Precaution. Starting with the definition of Sustainable Development as provided in the report “Our common future”, namely “Sustainable development is a development (a) meeting the needs of present generations (b) without compromising (c) the capacity of future generations to meet their own needs”, we can conclude that Sustainable Development cannot exist without the pillar of Precaution. Technological innovations largely influence present day developments, but they simultaneously bring with them many risks and uncertainties. Present generations, therefore, need a sufficient level of protection against these risks and uncertainties. The Precautionary Principle draws attention to this need and is meant to develop and implement the necessary safeguards. It is, moreover, meant to prevent possible unacceptable irreversible damages that threaten the conditions of existence of future generations. To conclude, the Precautionary Principle is a central notion for the concept of

¹ O’Riordan, T., Cameron, J. & Jordan, A. (eds.) (2001). *Reinterpreting the Precautionary Principle*. London: Cameron May.

Sustainable Development to the extent that it draws attention to possible unacceptable negative effects and stimulates action to prevent them.

Precaution versus Prevention

Precaution is fundamentally different from prevention. Prevention can be applied in cases of well-known risks: possible harmful effects and the causes thereof are identified either via observation or via theoretical models. As soon as one leaves the domain of known risks and enters the domain of possible risks, precaution replaces prevention. Awareness of the possibility of a risk emerges from a series of indications and hypotheses that are not scientifically validated yet, but signal a certain threat. This lack of scientific validation can, among other things, emerge from extensions, both in time and in space, of the link between cause and effect.

Considered from the perspective of enterprises this extension in both space and time can be illustrated in the following classification.

Tableau 1 : risques technologiques et diffusion spatiale

Mesures de diffusion	Modalités particulières de prise en charge
Un risque confiné	<ul style="list-style-type: none"> ➤ prévention et gestion en bon propriétaire ➤ études de fiabilité, normes techniques, mesures de protection des travailleurs (ex. équipements de protection) ➤ réglementations spécifiques (ex. réglementation relative à l'utilisation confinée des micro-organismes génétiquement modifiés) ➤ mécanismes d'assurance privée ou de mutualisation de la charge du dommage pour les accidents et maladies reconnu(e)s comme étant professionnel(le)s
Un risque débordant	<ul style="list-style-type: none"> ➤ attention à la coordination dans les interventions post-accidentelles ➤ attention accordée à l'information vis-à-vis de l'extérieur des enceintes industrielles ➤ réglementations de type Seveso
Un risque réticulaire	<ul style="list-style-type: none"> ➤ mise en place d'un maillage destiné à recueillir les signaux d'alertes sur les dysfonctionnements, les incidents ➤ problème de l'imputation des responsabilités ➤ amélioration constante des techniques de calcul, d'évaluation et de relais en matière d'assurance (co-assurance, réassurance, pools)

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Mechanisms of prevention are originally devised to respond to isolated and neighbouring risks. They do not suffice as a defence against reticular risks. New mechanisms are needed in order to measure, monitor, control reticular risks: arrangements for tracability, warning systems that register even feeble or marginal signals.

Godard, Lagadec and other authors² indicate three remarkable trends with regard to present day sensibilities towards health and environmental risks. To start with, relevant risks are not only risks that are scientifically validated, but also possible risks. Second, many citizens are worrying about possible negative effects during the whole production

² Godard O., Gouyon P.-H., Henry C. et Lagadec P., « Le principe de précaution: différents cas de figure et différents points de vue », *Revue d'Economie du développement* 1/2, 2000, pp.175-186

chain (and not only about possible negative effects of the product itself). Finally, on a national and international level various packages of restrictions and rules are introduced for various types of products that possibly have significant health and environmental risks.

A Precautionary Ethics

According to Boehmer-Christiansen the German concept of *Vorsorge* integrates three meanings: caring for or looking after, fretting or worrying about and obtaining provisions or providing for (Boehmer-Christiansen 1994, 38). The interpretation of these three verbs in concrete situations depends on the value framework one holds. Hans Jonas, a German philosopher who emigrated to the United States, gave the Precautionary Principle an ethical base in his book *Das Prinzip Verantwortung* published in 1979 (Hergon et al. 2001, 438-439). In the view of Jonas, the ethical base of the Precautionary Principle is an ethics of responsibility. An ethics of responsibility is not straightforward in the field of public policy. Especially in a context of economic and political globalisation, an ethic of (political) liberalism obtains a firm footing.

Different Precautionary Approaches

In order to make the Precautionary Principle operational, it needs to be translated in procedures to be applied in various institutional contexts. This translation can take different forms. For our research project we deem the analytical distinction relevant that Mary O'Brien makes. O'Brien distinguishes between a harm oriented and a goal oriented interpretation of the Precautionary Principle.

In a harm oriented approach a particular technological application is the starting point of all considerations. The main question is whether - independent from possible advantages - it is sufficiently plausible that the particular application will cause so much harm that a precautionary approach is needed. It is the plausibility of sufficient harm that triggers the idea of Precaution.

In this harm oriented approach the scientific disciplines made an appeal to are in most cases restricted to biology and ecology. The central scientific research question is rather unequivocal: how plausible is it that a certain activity will kill living beings, will destroy a specific species or will hamper the normal development of humans, animals or plants. Little attention is spent to cumulative effects, to cultural effects or to data deficits.

In a harm oriented approach the concept of Precaution is triggered only after the plausibility of sufficient harm is established. Only at that moment the search for alternative technological applications begins. This implies that alternative technologies are not considered when the harmfulness of a specific technological activity - either or not with the help of small restrictions or adjustments - remains below a certain level that is deemed acceptable. In case one does consider alternative technologies, one tends to investigate only those alternatives that bear close resemblance to the initial technology.

In a goal oriented approach not a specific technological activity is the starting point, but a specific environmental or public health related goal. The central question here is: Which range of activities is feasible and acceptable to reach a specific goal? This question does not focus on risk analyses in the first place; it focuses on an evaluation of the possible advantages related to the various activities.

In a goal oriented approach the search for alternative technological applications is the step following immediately on the definition of the goal. The main concern in this phase of the process is whether all reasonable activities are considered. For that reason public

participation is very important. The active contribution of the public can prevent that possible alternatives are swept away in an early stage.

Considering a sufficient variety of alternatives in function of a predefined goal influences the quality of risk evaluations in a positive sense. In a harm oriented approach the central question is whether possible harmful effects of a certain activity remain below a certain threshold value. Adherents of this activity then have an interest in looking for the scientific data that testify to the safety of the activity. In this case the search for uncertainties is not stimulated at all. In a goal oriented approach less reason exists to avoid uncertainties. Every alternative is considered and the evaluation is not restricted to an evaluation of risks and uncertainties. The appraisal of possible advantages is as important. In addition the concept 'evaluation' gets a wider sense. Not only the effects for the environment or for human health are relevant for the goal aimed at, but also social, cultural, political, economic, aesthetic and distributive effects. In case one considers various alternatives with regard to various aspects, it will turn out that advantages and disadvantages are attached to each alternative. The crucial point then is to define the relative weight - gravity, irreversibility, uncertainty - of the various advantages and disadvantages; not to reach consent concerning sufficient or insufficient evidence of unacceptable harm. The final decision regards the choice of the most promising alternative (or the most promising set of alternatives) in function of the goal aimed at.

In a goal oriented approach it is not very likely that the scientific input remains restricted to biological and ecological information. Who aims at realising a predefined goal also needs social scientific information, for instance in order to estimate the effects of the different alternatives on the organisation of the production process, on employment, on consumer acceptance. Scientific discussions do not focus on the question whether the evidence gathered to show the harmfulness of effects suffices. They focus on the question which alternatives are best suited to realise given goals. In this sense, a goal oriented approach stimulates technological innovation.

In a goal oriented approach the Precautionary Principle plays its part during the whole process of selecting public goals and feasible alternatives. It does not only come in when a certain activity turns out to be sufficiently harmful. In a context in which one aims for positive goals, it goes without saying that questions concerning the necessity of certain activities are openly posed. Harm oriented approaches seldom question the necessity of an activity.

A goal oriented approach presupposes a continuous learning process, for scientists concerned as well as for citizens and policy people. Since the implementation of various alternatives involves many uncertainties a continuous monitoring of effects is necessary. Some alternatives can be more and others less harmful than initially expected. Or it can turn out that one urgently needs to look for new alternatives. Cooperation from all sides of a society and transparent participatory political processes are a condition to achieve public environmental and public health goals.

2.1.3. PRECAUTION AND SCIENCE

The nature of scientific knowledge

Risk societies invite us to think over the nature of scientific knowledge. Their reflexivity supports a constructivistic interpretation of science. A constructivistic interpretation recognizes that scientific concepts, laws and theories are socially constructed. This implies, to start with, that they are never neutral, but result from particular value-laden perspectives. Since the perspective influences the theory and many perspectives are

possible, many theories can exist that are both valid and that nevertheless are not simply consistent with each other. Moreover, the choice for a particular theory cannot be justified in a scientific way.

It implies, further, that scientific objectivity should not be understood in the sense of an unequivocal reflection of reality. Scientific knowledge is objective to the extent that it enjoys a certain consent within a particular scientific community. Scientific objectivity means intersubjective consent. This consent depends on a variety of decisions, that cannot be justified in a completely rational way. This interpretation of scientific objectivity explains why scientific theories are always susceptible to revision. The common acceptance of particular facts, laws and theories as scientific ones depends on processes of negotiation. During these processes factors such as power, rhetoric, charisma, financial means play their part. These processes are needed to close scientific disputes.

A social-constructivistic interpretation of scientific knowledge does not necessarily result in total relativism. Striving for scientific objectivity, i.e. for intersubjective consent, remains indispensable, because it implies a continuous testing of scientific statements. A constructivistic interpretation of science does, however, urge scientists as well as public authorities and the wider public to consider deviating insights and a plurality of value-laden scientific perspectives.

Unstructured or complex problems

In scientific literature one distinguishes between structured and unstructured problems (Craye *et al.* 2001a, 19). In case of structured problems, the problem definition is hardly questioned. Various parties consent with each other concerning relevant facts and values. Consequently, agreement exists concerning relevant scientific disciplines and disciplinary paradigms. The opposite is the case with unstructured problems. Moreover, unstructured problems are often complex problems. This implies that experiments that take place under laboratory conditions provide insufficient insight in existing complexities. On the other hand, experiments that take various complexities into consideration are for actual or ethical reasons not practicable. In case of complex problems the laboratory extends to real life and in real life one is not allowed to experiment unrestrictedly. Consequently, in case of complex situations scientists do not dispose of methods to test their hypotheses, to produce 'facts' and to confirm or falsify theoretical laws.

Unstructured (or complex) problems provoke various types (and typologies) of uncertainties (Craye *et al.* 2001a, 18). Stirling, for instance, distinguishes between uncertainty, ignorance, indeterminacy and incommensurability. In case of uncertainty the chance that identified harm will occur is sufficiently known. In case of ignorance not only uncertainty exists concerning this chance; one does moreover not know whether all possible harm is taken into consideration. In case of indeterminacy the evolution of complex systems cannot be determined, not because of a lack of knowledge, but because of the nature of the systems themselves. Systems can be chaotic or near to border situations, or they can be unpredictable because of human interventions. Incommensurability refers to the impossibility to translate various disciplines or paradigms into each other, to reduce one discipline or paradigm to another one or to construct one big, overarching theory. Scientific theories are not mere partial descriptions and explanations of reality; they are perspectivistic in nature and, for that reason, incomparable. The norms and values constituting the diverse perspectives are responsible for this incomparability.

Funtowicz and Ravetz distinguish two types of uncertainties. The first type emerges where the acts of observation and analysis become part of the activity of the system under study and so influence it in various ways. Think, for instance, of the phenomenon of self-fulfilling prophecy in reflexive social systems. The other type, that is more characteristic of

complex systems, derives from the fact that any analysis and observation must deal with an artificial, usually truncated system. The concepts in whose terms existing data is organized will only accidentally coincide with the boundaries and structures that are relevant to a given policy issue. Consequently, they need interpreting or massaging to make them relevant to the problem at hand. Along with their obvious, technical uncertainties resulting from the operations of data collection and aggregation, the data will have deeper, structural uncertainties, not amenable to quantitative analysis, which may actually be decisive for the quality of the information being presented.

The analysis that a plurality of legitimate perspectives exists, parallels the constructivist idea of science. The criteria for selection of data, truncation of models, and formation of theoretical constructs are value-laden, and the values are those embodied in the societal or institutional system in which the science is being done. No unique, privileged perspective on a system exists. This is, according to Funtowicz and Ravetz, not a proclamation of relativism or anarchy. It is rather a reminder that the decision process on environmental policies must include dialogue among those who have an interest in the issue and a commitment to its solutions. It also suggests that the process towards a decision may be as important as the details of the decision that is finally achieved. The task for a post-normal scientist is to recognize the various perspectives and to find or create some overlap among them all, so that there can be agreement or at least acquiescence in a policy. For those who have this integrating task, it helps to understand that this diversity and possible conflict is not an unfortunate accident that could be eliminated by better natural or social science.

These two key properties of complex problems, radical uncertainty and plurality of legitimate perspectives, show why environmental policy can not be shaped around the idealized linear path of gathering and applying scientific knowledge.

Normal and Post-normal Science

The concept of post-normal science is introduced by Funtowicz and Ravetz as a scientific approach that is suitable for environmental policy under conditions of complexity³.

The insights leading to Post-Normal Science are that, in the sorts of issue-driven science relating to environmental debates, facts are uncertain, values in dispute, stakes high and decisions urgent. Consequently, the conditions are not normal, neither for science nor for policy. In “normality” the process is managed largely implicitly and is accepted unwittingly by all who wish to join in. This assumption of normality does not hold in relation to the environment. Under post-normal conditions the previous distinction between “hard”, objective scientific facts and “soft”, subjective value-judgements is inverted. We must often make hard policy decisions where our only scientific inputs are irremediably soft. Under such conditions the normal-scientific goal of achieving truth or at least factual knowledge may be a luxury. The guiding principle of post-normal science rather is ‘quality’. Here, quality refers to process at least as much as to product. In complex environmental policy issues, where neat solutions are lacking and support from all stakeholders is required, the quality of the decision-making process is absolutely critical for the achievement of an effective product in the decision. This quality relates to the extent that the decision-stakes of the various people concerned are reckoned with. It depends on open dialogue between all those affected, the “extended peer community”.

³ See <http://www.nusap.net> and:

Futures, 1999, Special Issue: Post-Normal Science, J. R. Ravetz (ed), 31:7.

Funtowicz, S.O. & Ravetz, J.R. (1992). Three Types of Risk Assessment and the Emergence of Post-Normal Science.

In S. Krimsky & D. Golding (eds). *Social Theories of Risk*, Westport (CN), Praeger, pp. 251-273

Funtowicz, S.O. & Ravetz, J.R. (1993). Science for the post-normal age, *Futures* 25:7, 739-755.

Funtowicz, S.O. & Ravetz, J.R. (1997). The Poetry of Thermodynamics, *Futures*, 29:9, 791-810.

The concept “post-normal science” summarizes very well in what sense a scientific approach tailored to the Principle of Precaution differs from the usual or “normal” scientific approach. Post-normal science does not imply a rejection, but rather a broadening of the normal scientific method. Sketched briefly, one can grasp this broadening under the following three denominators: 1) not only quantitative, but also qualitative information, 2) no rigorous separation between facts and values, and 3) form an external to an internal perspective. We will amplify on these three dimensions.

A precautionary approach requires, besides an analysis of risks, insight in relevant uncertainties. “Normal” sciences soon interpret uncertainties as deficient scientific information⁴. Where uncertainties pop up, one is inclined to underestimate the research results, to deny the existence of a problem or to minimize the importance thereof. A prerequisite of a science tailored to Precaution is that scientists recognize uncertainties. A Post-normal science ought to be explicit about uncertainties and possible mistakes. It should provide a more embracing quantitative and qualitative analysis and description of a) the sources, the type and the degree of uncertainties, b) the feasibility of reducing uncertainties with the help of further research, and c) the implications of uncertainties. In traditional risk analyses stress is on quantitative, statistical information. Effects that cannot be quantified often disappear beyond “normal” scientists’ scope. At the same time quantitative analyses do not provide the kind of information that is relevant in a context of public policy: information concerning the meaning of quantitative results and the extent and type of evidence these results are based on, concerning the factors that lead to these results, concerning the specific context the results are valid for, concerning the meaning of these results for specific groups and individuals. Certain aspects of scientific knowledge – for instance regarding the complexity of a problem, the interconnectedness of various relevant factors, the experience the scientific judgement is based on – cannot simply be presented in a numerical way.

Normal science is based on the positivist supposition that facts can be separated from values. Post-normal science recognizes that facts and values can at most be distinguished, but not separated. Observation and description of facts are not unrelated to the perspective – and hence to values and norms – of the observer. Various perspectives, domains of relevant phenomena and decision contexts lead to various descriptions. These descriptions are non-equivalent⁵. No privileged methodical approach of complex systems exist that results in one single objective description. Various perspectives lead to various, legitimate descriptions. Consequently the quality and validity of scientific information concerning uncertainties is under debate. One can only decide on quality and validity in a debate representing different scientific disciplines and actors concerned. “Quality control can no longer be performed by a restricted corps of insiders [...] Knowledge of local conditions [...] can also determine which data is strong and relevant” (Funtowicz en Ravetz, quoted in Haag & Kaupenjohann 2001). Post-normal science replaces the instrumental and strategic rationality of a normal scientific approach with a communicative rationality. Consultation of and discussion between the various actors concerned are needed to identify relevant phenomena, to define the problem and to frame the observations. Consequently, post-normal science implies a participative approach. It, moreover, makes higher demands on transdisciplinarity⁶. It does not suffice to put insights from different disciplines next to each other. It is important to come to an integration of

⁴ Funtowicz en Ravetz quoted in Tickner, J.A. (2003). The Role of Environmental Science in Precautionary Decision Making. In: J.A. Tickner (ed.), *Precaution, Environmental Science and Preventive Public Policy*. Washington/Covelo/London: Island Press, p. 12-13

⁵ Haag, D. & Kaupenjohann, M. (2001). Parameters, prediction, post-normal science and the precautionary principle – a roadmap for modeling for decision-making. *Ecological Modelling*, 144 (1), p. 45-60.

⁶ Tickner, J.A. (2003). The Role of Environmental Science in Precautionary Decision Making. In: J.A. Tickner (ed.), *Precaution, Environmental Science and Preventive Public Policy*. Washington/Covelo/London: Island Press, p. 11.

insights. It is, finally, not compatible with a strict separation between assessment and management of risks and uncertainties.

Normal science is built up from the perspective of an external observer⁷. Scientists are outsiders with regard to their research domain. This allows them to describe their research domain in terms of constant, essential features and regularities. The system described is caught in a static model. Post-normal science, on the contrary, considers the research domain to be variable, developing, open to new phenomena and characteristics. Post-normal scientists understand themselves as part of their research domain. They are no external, but internal observers: their observation co-influences the evolution of their research domain. This implies, to start with, that post-normal scientists make use of procedures that allow them to detect new phenomena (e.g. monitoring) and to integrate new scientific and experiential knowledge and changing political concerns⁸. This implies, secondly, that they strive for a contextualized scientific knowledge⁹. In case of complex problems, the reliability of information does not depend so much on its universality, i.e. its independence from concrete circumstances in a specific human and natural environment. It depends, on the contrary, on its sensibility to the concrete and local. The value of scientific models and knowledge depends on the specific policy problems to which they apply and the specific social, economic and ecological context in which they occur. Here again the importance of participative procedures is shown: a variety of internal perspectives helps to tailor the problem definition and the scientific approach to the local situation.

A precautionary approach calls for a specially adapted “post-normal” scientific approach. Post-normal science meets other needs than normal science does. For that reason Nowotny suggests that an institutional distinction is needed between academic science and public policy science¹⁰.

Science versus Precaution

The question how to make the Precautionary Principle operational provokes many discussions. The vagueness of the principle allows for divergent interpretations concerning the extent of societal changes needed ranging from rather small to very radical. This variety of interpretations occurs in a societal context in which citizens and stakeholders have different, often conflicting and important interests and divergent underlying visions. Consequently, it does not surprise the authors of the Stirling report¹¹ that the value and utility of the principle became the object of an intensive and polarized debate. An important matter in dispute is the question how a precautionary approach relates to scientifically founded policy. According to some a precautionary approach is at odds with a scientific one¹². Other authors contradict that a precautionary approach is not compatible with a rational, scientific method (Tickner 2003, xiv; Stirling *et al.* 1999; Jasanoff 2003; Levins 2003, Goldstein 1999). This controversy regularly pops up where legal rules based on the Precautionary Principle challenge international rules for free trade as they are laid down by the WTO.

⁷ Haag, D. & Kaupenjohann, M. (2001). Parameters, prediction, post-normal science and the precautionary principle – a roadmap for modeling for decision-making. *Ecological Modelling*, 144 (1), p. 45-60.

⁸ Tickner, J.A. (2003). The Role of Environmental Science in Precautionary Decision Making. In: J.A. Tickner (ed.), *Precaution, Environmental Science and Preventive Public Policy*. Washington/Covelo/London: Island Press, p. 14-15.

⁹ Haag, D. & Kaupenjohann, M. (2001). Parameters, prediction, post-normal science and the precautionary principle – a roadmap for modeling for decision-making. *Ecological Modelling*, 144 (1), p. 45-60.

¹⁰ Haag, D. & Kaupenjohann, M. (2001). Parameters, prediction, post-normal science and the precautionary principle – a roadmap for modeling for decision-making. *Ecological Modelling*, 144 (1), p. 45-60.

¹¹ Stirling, A. *et al.* (1999) *On Science and Precaution in the Management of Technological Risk*. Final Report of a project for the EC Forward Studies Unit under the auspices of the ESTO Network commissioned by Dr. Michael Rogers, CdP, Brussels, p. 6-9

¹² Zie bijvoorbeeld diverse bijdragen in Morris 2000.

This controversy between those who do and do not see a contradiction between a scientific and a precautionary approach is based on divergent interpretations of science. The former ones find that public policy should be based on ‘sound science’: scientific information based on (quantitative) risk assessments. The latter ones find that current ‘sound science’ practices fall short in various respects. Normal ‘sound science’ practices refuse to recognize the value-laden dimension of scientific controversies. They are rather reductionist and mono-disciplinary, so that they tend to lose sight of wider interconnections. They strive for reduction of uncertainties and tend to hide irreducible uncertainties (ignorance, indeterminacy, incommensurability) from view.

According to McGarvin, it does not make sense to ask whether the Precautionary Principle is scientific or not¹³. In his view, as a Principle, it is exactly that: a social norm to guide public policy. Science is simply a tool for testing assertions of fact. Scientific appraisal is needed in order to implement the principle: to assess the options available for providing a service. And this assessment will score better in terms of precaution in case the scientific approach represents a broad, multi-disciplinary framing of questions, is not summing incommensurable factors, evaluates in a methodical way all fields and claims to knowledge, avoids domination by any one discipline, implements defensive research strategies to limit exposure to ignorance, and fiercely strives for independence from interest groups.

2.1.4. PRECAUTION IN PUBLIC POLICY

Science and Policy

Two models of the relationship between science and policy are common: the technocratic and the decisionistic. According to the *technocratic* interpretation, policy is rational on condition that it is scientific. Therefore, political considerations should be cleaned from irrational and emotional elements. What remains, is an unequivocally rational, scientific policy. According to the decisionistic interpretation, on the contrary, politics and public policy unavoidably are irrational. After all, persons taking policy decisions have to make value-laden choices. And one cannot discuss reasonably about values – at least according to the tradition set in by Max Weber. Nevertheless, even in the decisionistic model objective sciences fulfill an essential role. Scientists are deemed to point possible choices and the consequences thereof out to persons engaged in public policy. In this way they provide public authorities with the necessary stuff in order to allow for well considered, though irrational, political decisions. Both interpretations have the basic conviction in common that science is separated from politics and policy. Scientists offer neutral knowledge; public authorities apply it. Science provides for “truth”; public policy negotiates about “values”.

In the second half of the previous century philosophers of science developed a new interpretation concerning the relationship between policy and science¹⁴. Since scientific knowledge is constructed by men of flesh and blood operating from specific social contexts, it is liable to influences of power and interest. In a certain sense scientists are part of the political process. Weinberg even speaks of a co-production of science and policy. For the questions the scientific advisory committees should respond to, are formulated by one or more stakeholders in the policy process. Scientific research questions are not neutral, but socially constructed, value-laden entities. The values embedded in the social context influence the outcomes of scientific research. For that reason sciences cannot be considered apart from the context in which research questions are generated. There is not

¹³ McGarvin, M. (2001). Science, Precaution, Facts and Values. In: T. O’Riordan, J. Cameron & A. Jordan, A. (eds.). *Reinterpreting the Precautionary Principle*. London: Cameron May, p. 44.

¹⁴ Craye, M., Goorden, L., Van Gelder, S. & Vandenaabeele J. (2001a). *Milieu en gezondheid: naar een adequate dialoog tussen overheid, bevolking en wetenschap*. Rapport in opdracht van de Vlaamse Gemeenschap, Administratie Gezondheid, p. 23.

any longer a neat separation between science and policy. Instead of separation, there is a continuous interaction. Habermas termed this model of the relationship between science and policy *pragmatic*. In this pragmatic model the role of the wider public is indispensable. ‘Dans le modèle pragmatique, les recommandations techniques et stratégiques ne peuvent s’appliquer efficacement à la pratique qu’en passant par la médiation politique de l’opinion publique. En effet, le dialogue qui s’établit entre les experts spécialisés et les instances de décision politique détermine la direction du progrès technique à partir de l’idée qu’on se fait de ses besoins pratiques, en fonction d’une certaine tradition, tout autant qu’il critique et mesure cette idée aux chances que la technique lui donne de voir ses besoins satisfaits; et ce dialogue doit justement être en prise directe sur les intérêts sociaux et les orientations d’un mode vécu social donné par rapport à certaines valeurs’¹⁵.

Trust

The many uncertainties surrounding scientific knowledge bring the concept of trust into prominence. Since science cannot provide political decisions with unquestionable information, the acceptability of both scientific input and of political decisions will depend on the extent that the wider public has confidence in the procedures leading to them. What does ‘trust’ in a democratic institution – as is for instance a scientific advisory committee - however mean?

According to Offe, the values of “truth” and “justice” are essential components of trustworthy institutions (Offe 1999, 72-76). In both cases, Offe distinguishes between an active and a passive version. The passive version of “truth” is “telling the truth”. The active version is “keeping one’s promises”. The passive version of justice is “impartiality”; the active version “solidarity”. Considering these values form both the perspectives of precaution and of a social constructivist philosophy of science, what could they mean?

With regard to the passive variant of “truth”, we can keep it briefly. This passive variant – honesty, authenticity - relates to an active striving to look for and try to eliminate untruths – either lies or mistakes. This is nothing else than the scientific pursuit of “objectivity”: the mutual controlling, testing, checking, questioning and doubting of preliminary scientific certainties by the members of a scientific community. This continuous pursuit results at best in – provisional – intersubjective consent, called scientific objectivity. Scientific objectivity, or truth in its passive variant, is an ideal to strive for, not a settled fact that goes without saying.

What about the active variant of the value “truth”, namely “keeping one’s promises”? A meaningful translation of this value in the case of sciences dealing with unstructured problems is the active searching for diverse forms of uncertainties (uncertainty, ignorance, indeterminacy and incommensurability). Only to the extent that scientists are aware of the limits of their capacity and hence of remaining uncertainties, are they capable of keeping their promises. Making uncertainties explicit preserves scientists from loss of trust in their predictive capacity. For that reason scientists cannot restrict themselves to risk analyses in the narrow sense of the word. Risk analyses ask for known causal relationships that can be applied to predict (possibly in a probabilistic way) the effect of a specific technological intervention. In case no causal relationships are known that predict an adverse effect – which is, for instance, often the case with genetically modified products – one declares the intervention safe for human health and the environment. Scientists restricting themselves to such risk analyses – and basing themselves chiefly on scientific certainties – are in

¹⁵ Habermas, J. Scientification de la politique et opinion publique. In: *La technique et le science comme idéologie – La fin de la métaphysique*

danger of having to revoke their reassuring promises later on. This certainly does not encourage citizens' trust in scientists¹⁶.

How to interpret “impartiality”, the passive variant of the value of “justice”? From a social-constructivist perspective impartiality cannot be read as neutrality. For all scientific knowledge is unavoidably non-neutral, since value-laden. Elaborating on the work of the philosopher Hannah Arendt, we can conclude that scientific impartiality refers to the capacity to make power relationships explicit¹⁷. Scientific impartiality is an outstanding political concept. It is essential for politically impartial acting, according to Arendt, that people relate to one another as free and equal individuals.

What does “freedom” mean for post-normal scientists negotiating with each other during the process of knowledge production? Post-normal scientists are free to the extent that they are aware of their own interests and that they also make them explicit before their colleagues. Mutual recognition of interests enables the participants to place their interests “between brackets” for a while and to reflect, from a position that is intellectually speaking more disengaged, on a more fundamental base of shared interests and values.

How can we understand “equality” in the process of scientific advising for public policy? In order to stimulate the creativity in the process of knowledge production it is, again according to Arendt, necessary to admit a variety of perspectives. From this we can deduce that a balanced distribution of opportunities is needed for all actors concerned to introduce their own perspective, related to their specific experiences, in the process. This implies, to start with, that all relevant disciplinary perspectives should get a place in the process. It implies, moreover, that not only the perspectives of the various stakeholders, but also of the wider public should be represented. “Equality” in this latter case implies that other than scientific arguments should receive the same attention and chances, as long as they satisfy criteria for logical reasoning¹⁸. The argumentation of experts occurs via systematic empirical research and abstract knowledge based thereon. The argumentation of citizens is rather based on anecdotes and personal experiences mixed with emotional reactions. A dialogue between both is impossible when experts continue to regard citizens' argumentation as irrational and when citizens consider scientific experts as emotionless (and often commercially bound) technocrats.

Finally the question remains with regard to the meaning of “solidarity” in the process of scientific advising. In a risk society citizens are not only subject to the type of social risks that are typical for industrial societies (diseases, industrial accidents, discharge, unemployment). Another type of risks has arisen, risks that threaten human health and the environment. These risks do not run according to the same dividing lines as the welfare risks that are typical for industrial societies. Pollution of water and air, global warming, radioactivity, toxic substances in food threaten cities as well as the countryside, poor and rich, North and South. Solidarity in a risk society then concerns not only a just “distribution of goods” (redistribution of wealth, allocation of social rights, social security), but also a just “distribution of bads”. For post-normal scientists solidarity then means that scientists explicitly investigate to what extent risks and uncertainties hit people differently in different societal positions – with regard to health and environmental effects as well as socio-economic effects.

¹⁶ Strand, R. (2001). The role of risk assessments in the governance of genetically modified organisms in agriculture, *Journal of Hazardous Materials*, 86, p. 193-196.

¹⁷ Deblonde, M.K. (2002). *Economics as a Political Muse. Philosophical Reflections on the Relevance of Economics for Ecological Policy*. Dordrecht: Kluwer.

¹⁸ Craye, M., Goorden, L., Van Gelder, S. & Vandenabeele J. (2001a). *Milieu en gezondheid: naar een adequate dialoog tussen overheid, bevolking en wetenschap*. Rapport in opdracht van de Vlaamse Gemeenschap, Administratie Gezondheid, p. 46.

*A new model of deciding**An iterative activity*

A Precautionary approach implies that decisions concerning possible unacceptable negative effects cannot be taken once and for all. Decisions with regard to non revealed risks are always preliminary. They are open to revisions depending on the rising of societal controversies or of new scientific information. They will regard temporary measures to ameliorate scientific knowledge concerning hypothetical risks. New scientific information will urge for a new societal consensus with regard to the risks perceived and for new or adapted measures to deal with these newly or differently perceived risks.

In the following table, the iterative model is compared to the traditional model¹⁹.

Choix tranchant (décision traditionnelle)	Enchaînements de rendez-vous (décision en incertitude)
Un moment unique, un acte	Une activité itérative enchaînant des décisions de second rang
Pris par un acteur légitime	Engageant un réseau d'acteurs diversifiés selon les responsabilités
Clôturée par l'autorité scientifique ou politique	Réversible, ouverte à de nouvelles informations ou à de nouvelles formulations de l'enjeu.

The exploratory role of controversies

Societal controversies can play an important role in the decision-making process. According to Callon, Lascoumes and Barthe controversies allow for an exploration of the actors concerned, of the problems perceived and of the solutions conceived²⁰.

- 1) The distribution of interests and identities of the various actors concerned is not known in advance. It is formed and revealed in the course of the controversy. Controversies, thus, allow for detecting what types of actors and what kind of interests are relevant, in a particular society, with regard to a particular problem domain.
- 2) Controversies also allow for discovering the various aspects connected to a particular problem domain. The problem definition is, again, constructed and reconstructed while the controversy is going on.
- 3) Controversies, finally, clarify which solutions are conceivable. The original solution developed by the promoters of a particular technological application can be supplemented with other possible solutions popping up while the controversy is raging.

'Parce qu'elles mettent en forme un triple inventaire, celui des acteurs, des problèmes et des solutions, les controverses constituent un très efficace dispositif d'exploration des états du monde possibles lorsque, du fait des incertitudes, ceux-ci ne sont pas connus²¹. This latter conclusion urges us to integrate direct lines of communication between experts and lay-people in the decision-making process. Direct communication can result in discovering other viewpoints and mutually transforming them, so that they can turn into socially robust solutions.

¹⁹ Callon, M., Lascoumes, P. & Barthe, Y. (2001). *Agir dans un monde incertain- essai sur la démocratie technique*, Seuil, coll.La couleur des idées, p. 307.

²⁰ *Op.cit.*, p. 50

²¹ *id.*, p.55

2.1.5. PRECAUTION AND COMPANIES

The precautionary regime is not entering in an empty world: a large number of rules, obligations and managerial norms pre-exist in the field of prevention. The traditional mechanisms tailored for the assessment and management of well-known technological risks have been developed within the companies along three paths: safety of systems and processes (reliability studies); ecological and sanitary effects of facilities or processes (e.g. major hazards regulation) and ecological and sanitary effects of products (e.g. rules related to the food chain security).

However, the traditional concept of prevention against technological risks shows its intrinsic limits. The obvious distinction between natural risk and manufactured risk is not always pertinent. Geographical density of risks and domino effects need nowadays to enlarge the scope of prevention's mechanisms. Furthermore, the traditional thresholds of noxiousness aren't adequate to capture all kinds of technological risks, for instance some very small doses should induce heavy and irreversible damages on the long term. And finally, safety norms may create a feeling of security and, due to that, nobody should take really care of the risks.

Those traditional mechanisms aren't adequate to face up uncertain risks. Within instable environments, characterized by uncertainty or ignorance, the precautionary regime helps to set up alert and traceability procedures and mechanisms, it requires to deepen the scientific knowledge about the risks and to adopt temporary measures in order to avoid irreversible and heavy damages.

Some authors²² argue that the precautionary principle exclusively concerns public policy but others argue that the judge may refer to the precautionary principle in order to force companies²³.

We are in favour of the second argument. We do contend that the companies' duties regarding emergent risks are derived from the duties of public authorities. The duties of companies are related to provision of information.

The companies have to inform public authorities through:

- the provision of initial information concerning their activities and the associated risks (risks related to the production, risks related to the consumption);
- the provision of additional information about risks (as soon as they get more information about emergent risks);
- the setting up of traceability systems throughout their whole chain of production;
- the involvement into contradictory expertises organised by public authorities.

2.2. CASESTUDIES

Next to the theoretical work, both FTU and STEM carried out some case studies. The results thereof will be presented hereafter.

²² Ewald François, « Philosophie politique du principe de précaution », Ewald F., Gollier Chr., de Sadeleer N., *Le principe de précaution*, PUF, Que sais-je, 2001, p.54

²³ Boy Laurence, « Réponse à Olivier Godard », *Natures-Sciences-Sociétés*, forum A propos du principe de précaution, 2001, vol9, n°1, 48-52 et Godard Olivier, « Réponse à Laurence Boy », id. ;

2.2.1. FIRST STAGE OF CASE STUDIES INTO COMPANIES

Objectives

Through the empirical phase, we pursue three objectives:

- a) to properly represent the constitution of expertise on technological risks within the companies;
- b) to figure out the relationships between companies and public agencies in charge of the assessment and/or management of new risks;
- c) to assess the implications of the precautionary principle for the private sector.

Tasks

There are three kinds of studies:

- case studies on enterprises dealing with classical risks, facing prevention requirements;
- case studies on enterprises facing technological risks which are not yet well documented;
- case studies on external bodies in risk management (advisors, insurers, inspection, etc.).

There are several reasons why we have decided to split the case studies into three categories. The first one is that the private companies have already an impressive background in the field of prevention; therefore, we need to know more precisely how the companies are facing prevention requirements, who are the key persons dealing with risk assessment, which difficulties they meet in the strategic and operational management of classical risks. Having in mind the way the companies are facing up with classical risks, one will be in a more appropriate position to analyse the implications of precaution for the private sector.

The second one is due to the fact that companies already rely on external support for risk assessment and risk management (for instance, bodies in charge of occupational health and safety education, insurance companies). The construction of expertise within the private sector is a diffused process that one has to map adequately through empirical research.

Personal interviews have been held to collect opinions from security managers, environmental managers, quality managers, and members of the internal prevention and protection service, R&D managers.

This is the basic check-list for interviews:

- ✓ General overview (core business, collective bargaining with occupational safety and health aspects, sub-contractors, internal committee for prevention, internal department for prevention, certification related to quality-environment-safety, Seveso labelling).
- ✓ Characterization of the workflows and processes
- ✓ Classical risks related strategy (prevention within the company's general strategy, legal and conventional duties concerning prevention, methods of risk assessment, prevention measures, follow-up, crisis management, insurance portfolio)

- ✓ Emergent risks related strategy (dealing with threats, internal precautionary measures, follow-up, exchange of information with public authorities and bodies).

Cases studies have been carried out in the following companies:

- Air Liquide Belge
- Pfizer Animal Health
- Sita Treatment
- CHR
- Chimac Agriphar
- NMC
- Knauf Alcopor
- SCNB
- Eternit

Case studies have also been carried out concerning external bodies

- SPMT (external service for occupational health)
- Securex (id.)
- Gerling NCM (insurance company)
- SPF Emploi et travail: inspection médicale
- SPF Emploi, Travail : inspection technique
- SPF Emploi et travail : Direction des risques chimiques
- Fonds des maladies professionnelles
- DGRNE : cellule risques accidents majeurs
- DGRNE : Division de la police environnementale, inspection Seveso
- Administration communale de Namur, service établissements classés et permis unique
- Issep
- FEB-VBO, service prévention et sécurité
- CSC, service entreprise

Intermediary results

Our first comments deal with the place of security in the firm's strategy : there are always several factors of danger and there is a heavy influence of the sector of activity.

The identification of risks themselves still raises problems, whether the companies are of a Seveso-type or not. The requirement for multidisciplinary assessment of risks isn't yet fulfilled. The management of accidents or quasi accidents is organised within the

companies by themselves, with specific ways of reporting. The management of accidents doesn't raise any particular problem.

The small and medium companies heavily rely on external expertise, especially on external services for prevention and protection. Some consultancy cabinets have got a monopoly on the redaction of security reports within Seveso companies.

There is a major focus on established risks, mainly in the field of occupational health and safety. But those established risks still need more human resources, financial resources, training, communication of risks.

There are connections between the management of occupational health and safety issues on the one hand and the management of environmental issues on the other hand. This is due to the fact that, in many companies, the same persons are in charge of security, quality and environmental issues. But, there are very few connections between the management of those issues and the management of safety of products.

The public capacity of control and inspection has been progressively eroded, except for Seveso companies. The current ratio of inspectors is lower than the ratio adopted by the norms of the International Labour Organisation, which have been ratified by our country. This erosion is slightly counter-balanced by the fact that companies try to get security certificates. But how are these certificates delivered?

And finally, one could notice four trends in the way companies deal with uncertain risks:

- 1) Companies do establish very pragmatically a 'security circle' larger than legally imposed.
- 2) Companies do organise their own research on risks related to their core business.
- 3) Companies tend to establish mechanisms to avoid, to reduce or to follow emergent risks.

2.2.2. REMAINING QUESTIONS

- Which hierarchical levels and functions are concerned with the assessment and management of emergent risks?
- Is there social dialogue concerning emergent risks?
- How to inform and to educate workers to deal with uncertainty?
- Are there good practices within firms regarding precautionary measures?
- Does anyone notice specificities of precaution depending on the sector of application?
- Which are the appropriate channels through which the private sector could contribute to a collective care of new risks?

2.2.3. THE BELGIAN BIOSAFETY COUNCIL

Task

The Belgian Biosafety Council has the task to evaluate the biosafety of genetically modified organisms²⁴. “Biosafety” means safety for human health and the environment including the protection of biodiversity when using genetically modified organisms or micro-organisms. The scientific evaluation has to take place step by step and case by case. Moreover the Precautionary Principle applies as a first priority and the familiarity principle as a second one. The evaluation has to be scientific in order to contribute to an objective and harmonious treatment of dossiers. This task seems to be based on the idea that assessment and management of risks can be separated.

Procedures for a scientific evaluation of biosafety are not only used to protect human health and the environment. They are also used for the purpose of scientific and economic interests. Objective and harmonious procedures are meant to support and stimulate scientific research regarding genetically modified organisms, to avoid unequal conditions of competition, to eliminate impediments – both between member states of the EU and within the federal state Belgium - for the development and the bringing onto the market of products containing genetically modified organisms. They are further intended to provide notifiers with a comprehensive and transparent legal and administrative framework.

In the Royal Decision of December 18, 1998 one can, moreover, find prescriptions for informing the public. Each dossier applying a licence for a field trial has to contain a proposal for informing the wider public with regard to:

- The description of the genetically modified organism, the name and address of the notifier, the location and the purpose of the field trial
- Methods and plans concerning monitoring and management of accidents
- Evaluation of foreseen effects for human health and environment.

The SBB (Section on Biosafety and Biotechnology of the Institute for Public Health – Louis Pasteur, the secretariat of the Belgian Biosafety Council) publishes the public dossier on the website of the Biosafety Council, next to the advice of the Council, the decision of the competent minister(s) and the protocol for cultivating the crop concerned.

Actors concerned

We can distinguish several types of actors concerned: civil servants, scientific experts, political representatives and stakeholders.

We can, again, subdivide the group of civil servants into three types: civil servants working for the SBB, civil servants that are members of the Biosafety Council, and civil servants working for the competent authorities. Each of them has different tasks and motivations. The members of the SBB co-ordinate the scientific advisory process (by inviting scientists, developing guidelines, chairing the scientific and other meetings, making reports) and they centralise the relevant information (legislation, scientific information, an archive with the relevant documents concerning the various notifications and their authorization procedure). They take care of the quality of the scientific advisory process. Civil servants

²⁴ See the EU Directive 90/220/EEG, the Royal Decision of December 18, 1998 en the report of Goorden, L., Van Gelder, S, Deblonde, M. & Vandenabeele, J. (2003). *Genetisch gewijzigd voedsel in Vlaanderen. Retrospectieve trendanalyse van het maatschappelijk debat (Genetically modified food in Flanders. Retrospective analysis of the societal debate)*. Brussel: viWTA (Flemish institute for Science and Technology Assessment), report nr. 1, 200 p.

that are members of the Biosafety Council watch over the relevance of the scientific advice for the policy context. Civil servants working for the competent authorities have to translate the scientific advice and the comments gathered by the members of the Biosafety Council in a policy advice.

We can subdivide the group of stakeholders into a group consisting of notifiers (a group with direct – economic - interests in the authorization procedure) and the wider public (a group with indirect, though non-negligible interests).

Bottlenecks

Hereafter we will summarize the most important bottlenecks we perceived with regard to the work done by the Belgian Biosafety Council (starting with the notification submitted and ending with the final political decision taken). These observations result from a document analysis and a round of interviews with twenty actors concerned in the scientific advisory process.

- 1) The various actors have no clear idea about how to interpret the Precautionary Principle.
- 2) The various actors dissent about the necessity and the content of uncertainty research.
- 3) It is not clear how open and transparent to communicate about uncertainties.
- 4) How can one make sure that the scientific advice fits in with societal concerns?
- 5) How to present a scientific advice to the Biosafety Council and to the competent authorities: how extensive should it be, should it give several options or only one option?
- 6) Most actors deem the distinction between a scientific and a policy discussion meaningful, but no clear idea exists what this distinction is about
- 7) How to guarantee the impartiality of the scientific committee (which disciplines should be represented, how can one make sure that the representatives of the various disciplines are present at the meetings, how to make sure that the – economic as well as political - interests of the experts are sufficiently known)?
- 8) What information does the Biosafety Council need in order to translate the scientific advice of the scientific committees in a sound policy advice? What does the precise task of the Biosafety Council consist of? What actors should the Biosafety Council be composed of: experts only or also political representatives?

Remaining questions

To wind up our presentation of the case “Biosafety Council” we present some remaining questions we would like to investigate in the future of this research project. These questions are formulated after a workshop held with a (small) representation of actors involved in the scientific advisory process.

- 1) Who defines the topics to investigate in the scientific advisory process?
- 2) How does this definition come into existence? Is a negotiation phase needed? Do the topics have to be defined on a level transcending individual notifications?

- 3) Science and policy cannot be separated, but can they be distinguished? Is an active effort to make choices explicit advisable? Do we have to look for procedures or methods than can help to make choices explicit?
- 4) What kind of scientific information is useful in a policy context: quantitative or qualitative information?
- 5) What does qualitative information mean in case of complex problems?
- 6) What do scientists need to know/be able to in order to allow for a scientific advisory process that is as good as can be in case of complex policy problems?
- 7) Who is responsible for uncertainty research in the phase of field trials: the public authorities or the notifier?
- 8) Who is responsible for uncertainty research in the phase of market introductions: the public authorities or the notifier?
- 9) What conditions does uncertainty research has to fulfil in the phase of field trials and in the phase of market introductions?
- 10) Does one have to make into a rule what disciplines should be represented in the scientific committees?
- 11) In what way (financial, as regards content, procedural) can one really guarantee that the various relevant disciplines are represented?
- 12) What differences exist between the scientific advice of a scientific committee and the policy advice of the competent authority?
- 13) What conditions does a good scientific advice have to fulfil? How extensive does the justification for the advice provided have to be? Does it suffice to give one's motives for scientifically founded objections or does one also have to give one's motives for scientifically founded approval.
- 14) What conditions does a good policy advice have to fulfil?
- 15) What conditions (transparency, type of arguments) does a political decision have to fulfil?
- 16) Is it possible for public authorities to stimulate technological diversity and, thus, to realise the conditions for a comparison between alternative technological applications?
- 17) Is it possible for the Belgian public authorities to formulate clear lines of policy that respond to public concerns?
- 18) Do the Belgian public authorities have the right to streamline technological developments within enterprises in favour of societal concerns?
- 19) Is it meaningful to aim at such streamlining, given the international context?

3. FUTURE PROSPECTS AND FUTURE PLANNING

3.1. FURTHER CASESTUDIES

3.1.1. FURTHER FTU CASES

Through personal interviews within several companies or external bodies, we will pursue the analysis of the interactions between the actors involved in the knowledge-building process about emergent risks.

That will help to investigate the practical implementation of the precautionary principle in a private sector. That will also help to establish a list of bottlenecks in the relationships between scientists, private companies and public authorities among the assessment and the management of emergent risks.

3.1.2. THE HEALTH COUNCIL

At the beginning of November 2003 the results of the casestudy “Biosafety Council” will be tested and further developed in a workshop with members of the Health Council.

To start with, three members of the Health Council will present their own cases (in the field of radioactivity, of GSM’s and of chemical substances). Their presentation will be structured around questions given to them by the researchers. Secondly, we will organise a discussion regarding the ethical principles constituting the Precautionary Principle. Thirdly, we will discuss possible transcriptions of the Precautionary Principle in institutional procedures. Finally, we will make an inventory of what the participants will have learned during the workshop.

3.2. DEVELOPING SUGGESTIONS FOR THE TRANSLATION OF PRECAUTION IN (PUBLIC) SCIENTIFIC ADVISORY COMMITTEES AND (PRIVATE) SAFETY COMMITTEES

We will try out the Delphi-method to develop suggestions for Precautionary procedures. First, we will theoretically explore this Delphi-method. Second, we will apply this method and involve academic scientists, scientists working for NGOs, scientists working in civil services and in enterprises.

This exercise will result in a guide that can be used by civil servants and by members of safety committees in enterprises to check, to adapt or to develop their own procedures.

4. ANNEXES

4.1. PUBLICATIONS

Warrant F., 'L'entreprise face aux risques', *Lettre Emerit* n°33, hiver 2002.

For further information concerning the scientific profile of FTU, see <http://www.ftu-namur.org>

Deblonde, M. (forthcoming). Transgene gewassen: van Europese crisis naar transparant Belgisch beleid (Transgene crops: from European crisis to a transparent Belgian policy). *Sociaal en Economisch Tijdschrift*, December 2003.

For further information concerning the scientific profile of STEM, see <http://www.ufsia.ac.be/STEM>

4.2. DETAILED RESULTS

Warrant F., *Expertise, précaution et gestion participative des risques technologiques, revue de la littérature*, Contrat SSTC 0A/B9/002- tâche A.1., Fondation Travail-Université, Juin 2002, 135 p.

Warrant F., *Expertise, précaution et gestion participative des risques technologiques, jalons pour les études de cas*, Contrat SSTC 0A/B9/002- tâche B.1., Fondation Travail-Université, août 2002, 5 p.

Warrant F., *Expertise, précaution et gestion participative des risques technologiques, choix des études de cas et guide d'entretien*, Contrat SSTC 0A/B9/002- tâches B.2 & B.3, Fondation Travail-Université, octobre 2002, 30 p.

Deblonde, M. (2002). *Wetenschap en voorzorg in een interactief beleid van technologische risico's. Tussentijds rapport*. Literatuurstudie, Netwerkoevereenkomst nr. OA/04/001 – taak A. 1, STEM, 36 p.

Deblonde, M. (2002). *Wetenschap en voorzorg in een interactief beleid van technologische risico's. Casus Bioveiligheidsraad*. Documentenanalyse, Netwerkoevereenkomst nr. OA/04/001 – taak B, STEM, 14 p.

Deblonde, M. (2002). *Wetenschap en voorzorg in een interactief beleid van technologische risico's. Casus Bioveiligheidsraad*. Interviewleidraad, Netwerkoevereenkomst nr. OA/04/001 – taak B.3, STEM, 3 p.

Deblonde, M. (2003). *Wetenschap en voorzorg in een interactief beleid van technologische risico's. Casus Bioveiligheidsraad*. Globale analyse, Netwerkoevereenkomst nr. OA/04/001 – taak B.5, STEM, 32 p.