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HANDLING COMPLEX RISKS, ISSUES IN THE DOMAIN OF ENVIRONMENT AND HEALTH

"SCOPE"

R. Torfs, J. Buekers, K. Stassen, C. Zwetkoff, C. Fallon,
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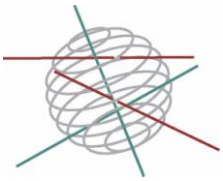

Transversal Actions

FINAL REPORT

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"SCOPE"

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SUMMARY

This research report has its origin in the notion that classical risk assessment paradigms no longer suffice to deal with complex, uncertain and ambiguous risks. Risk assessment was developed as a scientific tool to tackle uncertain consequences of human activities by organizing, evaluating, integrating and presenting scientific information to inform decision-making. Over the years, this type of risk assessment has proved effective in protecting public health and the environment from major environmental hazards with high relative risks. In the modern 'risk society' classical risk assessment fails to handle complex risks characterized by radical uncertainty and a plurality of legitimate perspectives and values. Public authorities have to deal with issues/risks were facts are uncertain and values are contested. To answer to the increased demands of policymakers and the public for guidance on risk management new processes for the governance of these risks need to be developed.

Weberian bureaucratic structures and forms of cooperation are working in a logic of specialisation of work, where distribution of information and knowledge, structures of decisions and allocation of responsibilities are organised ab initio in a stable organisational frame. Such a structure is not capable of resisting to the emergence of new risks which are often not identified as such at start and require a more integrative form of assessment, integrating inter-disciplinary collaboration on a specific policy problem that is complex, uncertain, perhaps unlimited in temporal and spatial scale, and interlinked with other phenomena.

If the frame of reflexivity (Beck, 2003) is adopted, we thus have to recognise that a global mastering of these risks is not possible. What is now requested is the settlement of conditions for another type of **open debate.** Experiments in new forms of public participation in the management of technological developments (like e.g. citizen panels on long-term storage of nuclear waste[1], or on cars and health[2]) already inspired the public administrators in their search for new procedural forms of decision making in areas of uncertainty.

For a certain category of risks inclusion of the public, next to industrial stakeholders, organised environmental interest groups and governmental agencies and administrations is warranted, to integrate different opinions and values and to develop adequate policies. **Network governance** should be developed, where stakeholders are invited to speak up and where power structures are reconsidered

[1] King Baudoin foundation, 1/2/2010

[2] Auto en Gezondheid, IST, may 2007 http://www.samenlevingentechnologie.be

and flattened. Here the authorities are recommended to exercise their capacities not as a centre of knowledge and top-down decision, but as a **facilitator** for communication and collaboration within networking structures, mobilising numerous experts and stakeholders, including the population itself (Gilbert, 2002), to develop new options which are socially acceptable and technically efficient (Fallon *et al*., 2008a & b). This requires a different mindset where the plurality of frames and fluidity of boundaries; the need for contextualisation; the construction of unstable temporary networks, the plurality of rationalities and the inherent uncertainties, social and technical (Callon, 1986) of the issues considered. As uncertainties are recognised, scientists are not anymore expected to close the controversy but rather to contribute to the technical quality of the process.

The public decision-making process (DMP) should be designed to organise the conditions for an optimal tradeoff between scientific soundness and social acceptability of decisions, in a context where the precautionary principle is relevant. The key issue, framing or “structuring the research questions”, is a method for deciding how to manage scientific uncertainty. From literature review and past studies, we posit that a better quality DMP could be achieved by using tools for an integrated and comparative risk assessment and management. These approaches rely on interdisciplinary risk assessment – relevant soft and hard sciences are engaged together into the knowledge production process rather than mobilized side by side. Concretely, it involves designing the steps or sequences of the process and selecting/developing/adapting risk assessment and management tools.

More specific, within the environment and health arena there is limited experience with these new concepts of integrated assessments (Briggs, 2008). Therefore case studies on various environment and health issues were performed to evaluate current integrated risk assessment practices, multi-level precautionary approaches and communication of complex risks. Different tools as Delphi, scenario workshop, *etc*. were used to analyse the issues at stake.

The development of an **integrated approach** in risk assessment requires cooperation across policy domains and hierarchical structures. In the field of **air pollution** a science-policy workshop confirmed that in the domain of air quality policy, public servants communicate well with researchers from scientific institutions. The protagonists in Flemish air quality policy have a common scientific background and are technical experts. This observation puts into question a common discourse postulating that there is a ‘communication problem' or 'gap' between 'researchers' and 'policymakers'. This discourse as a description of a state of affairs does not suit empirical reality, and needs to be reformulated in more precise terms. If there is a

communication gap, it is not to be situated between public administration (‘policymakers’) and researchers (‘scientists’), who share the same overall concerns, but between public administrations and ministerial cabinets.

The analysis of risks related to **electromagnetic fields** (EMF), showed how the precautionary principle is **reinterpreted differently at each different political level** (European, Belgian, Wallonia, Regional) in order to better integrate the local institutional and political environment. In most cases, when this principle is put at the foreground, its use is mainly symbolic and incantatory. When implementing policies it does not seem to respond to some precautionary approach, but rather to the institutional dynamics which characterise each political level. We observed the reinforcement of the European role in the field of health & environment: in attempts to underline institutional cooperation at the federal level in Belgium and to reinforce the authority of the regional government on the Walloon territory. From this case study it is learnt that the new deliberative spaces to be developed should not be embedded in the dominant institutional structures. A structure such as promoted in the wake of "**Technology assessment**" (Delvenne, 2011) is capable of conciliating production of knowledge and uncertainties (the science pole) with the plurality of social perceptions (the civic pole) and the specific dynamics of the relevant polity (the political pole). New deliberative spaces should be capable of developing the basis for integrated and comparative approach for emerging issues with due attention to its political and institutional dimensions, while maintaining enough distance with the dominant frames and logics. Recently the Flemish administration on Environment, Nature & Energy proposed a note (framework) to deal with uncertain risks. The proposed framework will be tested in a pilot study for potential risks related to non-ionising electro-magnetic radiation, and can later be extended to other risks.

In a case study on **Bisphenol-A** (BPA), multi-level political **communication** was analysed. Political decisions were taken without socio-technical debate (Callon, 1986). The BPA issue was not very high on the social or political agenda in Belgium. There was no crisis, no strong pressure form NGO's. The question was managed first by the European authorities (EFSA & European Commission). The Belgian institutions were waiting for the European position. As the political decision did not encounter a strong contestation from the industry, this was an easy step for the political authorities, in Belgium and at the European level, to symbolically address the issue while avoiding considering the real uncertainties. When the decision was taken to ban the use of BPA in polycarbonate baby bottles, it was a political decision taken with the support of the scientific bodies (Superior Health Council) but without being embedded in any social debate (what about risks related to the chemicals which may substitute BPA?). It meant that the whole of uncertainties on the extent of risks

related to the multiple exposures to different endocrine disruptors could not be put at the foreground in a public socio-technical debate.

These case studies on the interplay with science, policy and stakeholders, on the framing of an environmental health policy problem, and on the management of complex risks (air pollution, EMF, BPA) contribute to recommendations on their governance. The question then becomes: is it possible to organize a precautionary decision making process to deal with different legitimate frames and the necessary trade-offs when considering policy alternatives? Concretely it is advised to pay attention to the role of a focal point in the process, potentially taken up by public administrations, to the co-production, availability and organisation of knowledge and information, and to the progress of the process. Above all it is important to set up a **platform** for issue framing and problem definition to highlight key factors that need to be assessed:

- Examine the policy and stakeholder **learning network** related to a specific issue, with special attention to policy domains that are affected by or are affecting the environmental and health issue at stake. Specify who has interests in the issue and who should be involved. An efficient stakeholder network analysis is important for the further progress of the DMP. define who is allowed to take part in the process across different policy areas

- Examine the **information database** before setting up a more integrative approach, both from a scientific (including uncertainties) and technical (alternatives, CBA analysis) point of view and from the side of concerned stakeholders. Policy makers acquire information from different inputs from science, stakeholder organisations, socio-economic actors and the public at large, as well as from administrations and staff members, and are conscious of the structural and constitutional constraints. It is clear that a **balanced process of information gathering** that is transparent, contributes to better decision making.

- Initiate and manage the process: find out who will carry the process, set up a series of **interactions** between administrations, between administrations and cabinets, between administrations and research, between administrations, research and the public. Usable and meaningful available information on the issue should be communicated clearly to all stakeholders. It is innovative to look at how stakeholders **increase their knowledge** through different inputs and through communication, information and interaction.

- Iterate where needed: information gained in one dialogue should be fed back into other *fora*. An equilibrium between acceptability – tolerability – uncertainty should be established.

- Move forward / conclude. In the total policy cycle the conclusion or decision may be revised, when (1) monitoring of implementation and following

evaluation is considered as negative; (2) new knowledge / experience / issues have to take into account.

- Ensure an efficient and socially appropriate allocation of the resources and an adequate management of residual risks.

Last but not least, in a precautionary approach it is also required, to contribute to the public trust in the decision making process and to construct social acceptance of the final decision. Generally, a precautionary decision making process should be considered as a double-pronged learning dynamics: on one side, the authorities are required to better take into account the multiple frames which abound in our pluralist societies when organising the conditions of political trade-offs for the governance of risks. On the other side, the citizens should have the possibility to, not only understand, but also adopt the decision and its consequences and to conform to its implementation. It is important to develop specific communication processes to successfully implement these two faces of a precautionary approach in the governance of risks, while ensuring this dual learning process. New **procedures** are currently developed which could support the communication dynamics for promoting multiple frames and comparing openly different alternatives (*e.g*. **open process workshop; atelier scenarios; Delphi**).

Keywords: precautionary, socio-technical, across policies domains, comparative, alternatives, evaluation, communication

1. INTRODUCTION

During the past several decades, risk assessment was developed as a scientific tool to tackle uncertain consequences of human activities by organizing, evaluating, integrating and presenting scientific information to evaluate scientific evidence and to estimate the risk with the intention of informing decision-making (Eeckley *et al*., 2001). In other words, risk assessment has a science and a policy dimension, aiming to inform decision makers on real world problems (Rotmans & van Asselt, 2001). As such risk assessment is a methodological tool at the interface between science and policy. The three core components of risk assessment are (1) identification and estimation of hazards (establishing and determining the strength of the cause-effect link), (b) exposure and vulnerability assessment, (c) the estimation of the risk in terms of likelihood and severity of the consequences (Renn, 2005). In its original form, risk assessment is used for *"a chemical-by-chemical approach, focusing on a single media, a single source, and a single toxic endpoint"* (WHO, 2001), to identify its hazard and the dose-response relationship, and to assess exposure to the chemical, after which the risk characterized. Over the years, this type of risk assessment has proved effective in protecting public health and the environment from the more major environmental hazards for which the relative risk is high (Briggs et al., 1999). However classical risk assessment fails to handle complex risks (Martuzzi, 2005; Bridges, 2003) characterized by radical uncertainty and a plurality of legitimate perspectives (Funtowicz, 1999). Renn & Klinke (2004) highlight the importance of an **integrated assessment framework** (AF) when dealing with complex risks. 'Integrated' refers to assessment that crosses issues, spans scales of space and time, looks forward and back and includes stakeholder's perspectives. In other words, 'integrated' means that all relevant aspects of a problem must be considered simultaneously (Shlyakhter *et al*., 1995). Uncertainty takes a more dominant position now, and there is room for more qualitative descriptions of risks. Uncertainty forms the basis to go to more complex risk assessment and –management methods.

While the integrated risk assessment refers to the production of expertise (by scientific, lay people, *etc*.) on the target risk, **comparison** is part of a risk management approach focusing on the selection between alternatives. An inclusive risk assessment involves a reconstruction of the whole picture, with the attributes of the risk which are considered as relevant. A prioritization of alternatives involves a cognitive process of ranking risks/options/possibilities based on a selection of criteria.

Renn (2005) developed an **integrated analytic framework** (Figure 1) which provides guidance for the development of comprehensive assessment and management strategies to cope with complex risks. The framework integrates scientific, economic, social, and cultural aspects, and includes the effective engagement of stakeholders. Special attention is also given to dealing with uncertainty. The risk process in the framework is distinguished into four main phases: pre-assessment, risk appraisal, characterization and evaluation, and risk management. Inspired by the sequential approach of policy analysis (Thoenig & Meny, 1989), the model underlines the importance of feedback effects between the different steps of the process.

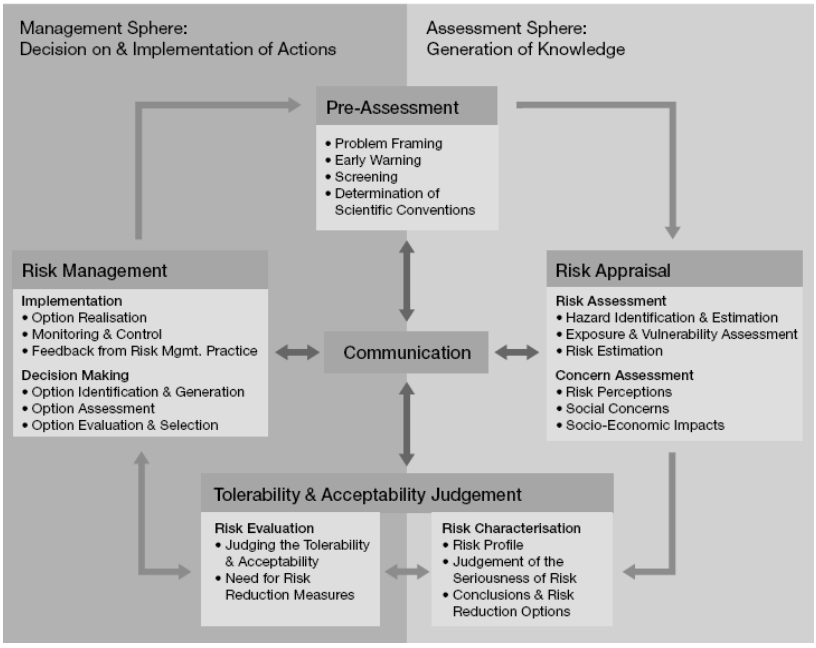

Figure 1: IRGC Risk Governance Framework (Renn, 2005).

Communication and **interaction** take a central position in risk governance framework. Risk **communication** refers to the process by which government agencies, the business, environmental and scientific communities, the media, representatives of the civil society and the public discuss risk with each other. Risk communication must be integrated in all phases. All stakeholders are invited to play an **interactive** role in both the assessment and management of risks (Renn, 2008). For a certain category of risks characterized by interpretative and normative ambiguity inclusion of the general public, next to industrial stakeholders, organised environmental interest groups and governmental agencies and administrations is warranted to integrate different opinions and values and to develop adequate policies. The discussion of **participatory processes and stakeholder involvement** (Hisschemöller *et al*. 2001; Renn, 2006) is more alive than ever (*cfr*.

Lange Wapper Bridge in Antwerp harbour). However, this risk governance framework (Figure 1) gives little attention to the **complex interplay** between scientific experts, civil servants and politicians, although a lot of attention is given to the two sides of the model. How is the knowledge generated in the right side of the model used in policy making in the left side? How do political choices and policy agenda shape the questions addressed by evaluators? In this project, all the case studies (industrial soil pollution; non-thermic health impact of electro-magnetic fields, air pollution by particulate matter; Bisphenol A in baby food packaging) focus on this complex interplay between researchers and policymakers.

In the "Risk Society" (Beck, 1992), public decision-making processes (DMP) have to deal with new forms of risks, the specific features of which (invisibility, spatio-temporal scale or scientific uncertainty) render them difficult to fit within the institutional settings and processes developed in industrialized societies for hazard management. Risks on the public agenda vary in at least two relevant dimensions in terms of interfacing science and policy-making: the continuum of scientific uncertainty about their very existence on the one hand; and the consensus about the social acceptability of their public management, including the selection of residual risks, on the other hand. The hypothesis is that managing these scientifically uncertain and socially controversial risks means designing new ways of dealing with them. Renn (2005) and others advise the application of the **precautionary principle** as management strategy in case of high unresolved uncertainty. The precautionary principle defines that when a serious risk is possible, actions can/must be taken without waiting for results of scientific research. When facing a risk that might invoke the precautionary principle, the question arises in the following terms: '*is it preferable to control (to handle, to postpone, or to prohibit) an activity which could reveal to be without danger as such having as consequence a waste of the limited resources (type-II error) or, in the absence of sufficient scientific evidence, not to control an activity which could reveal afterwards to be dangerous (type-I error)?'* Decision-makers are facing a dilemma originating in the impossibility to minimize simultaneously type-I and type-II errors. While some groups are focused on avoiding type-II errors, other stakeholders are concerned to track type-I errors. This difference in orientation between the different groups of stakeholders is sometimes at the source of sourness, mutual incomprehension and **tensions** and is illustrated in the case study 'electromagnetic fields' (EMF).

There's plenty of theoretical literature since the 90's dealing with integrated risk assessment and management including participation, developing conceptual models that place risk assessment in a wider context of uncertainty, trust,

perception and policy decision making and policy implementation. However, within the environment and health arena, there is limited experience with concepts of integrated assessments (Briggs, 2008). In Flanders research into complex environmental health problems using biomonitoring has successfully integrated risk communication, and stakeholder inclusion. But there is still a need to develop and implement a more general framework of risk governance for environment and health related risks in Belgium. Within the research project SCoPE **field research** is organized to shed light on the practicalities of several settings in different domains of policy action. After all, this research project wants to give an answer to the increased demands of policymakers and the public for guidance, recommendations on integrated risk assessment/management of systemic, uncertain, environment and health related risks. The goals are twofold: to identify the steps of integration and comparison and to integrate them into a scenario. If we refer to decision-making literature, we cannot ignore that current practices draw a quite different image, much more alike the garbage can model. A less extreme view is expressed by Lindblom: *'In the absence of systematic, simultaneous ranking, priorities change through some form of 'muddling through'. As individuals or organizations, we face some current jumble of risks. Periodically, a specific hazard draws our attention. After investing resources, we understand it better, possibly changing its place in the overall risk ranking. Then we turn to the next hazard, and the next. Over time, this sequential process should gradually improve the prioritization of the whole set.'* (Long and Fischoff, 2000). The case study on the development of soil cleanup policies illustrates the construction of a sequential approach to manage risks more efficient.

In this research we practically tested aspects for setting an integrated risk appraisal framework (AF) and validated **tools** which are applicable within this AF. Empirical work was performed in the form of 6 case studies to analyze and define the present framework and improve the communication between scientists, policymakers, and other stakeholders, and in the form of experiments, to test developed tools within the risk assessment framework. This study goes from theory to practice and back. At the end **recommendations** will be given which are helpful in dealing with actual risks.

The outcome of the study is a set of **guidelines** reporting on how to perform an integrated and comparative risk assessment for policymakers with due attention to the various dimensions which might hinder or support an integrative process.

2. METHODOLOGY AND RESULTS

The analysis (assessment and management) of different types of risks were studied. The cases were selected as public issues where scientific uncertainty combines with social and institutional uncertainty. We opted for complex long-lived cases ripe with controversies. Such cases gave the opportunity to observe how actors weave into networks, how these function, converge or not, how alignments, disalignments occur over time and what forms of contextualization are negotiated. Finding out the chronological order to investigate the evolution of one or several variables across time is an obligatory passage point to a more ambitious approach aiming at outlining causal relations, sequences, interdependencies. We were keen to relate the observed institutions and practices to their context and to report on their commonalities and singularities.

Emerging risks (*e.g.* bisphenol A or BPA; ElectroMagnetic Fields or EMF)

Risk assessments on these emerging issues rely on the basis of limited information. The question is: 'Is there any risk at all?' It means that judgement steps (about the tolerability of risk) and management options are being developed with limited available information. According to the type of framing, there can be relatively much (public or not) controversy. For these risks, uncertainties are very high, which hinders communication with the public (how to communicate under high uncertainty) and public management of the issue (how to decide / manage such uncertain issues, while the information network is so loose).

The first case study (EMF) analyses a conflict about the siting of mobile phone transmission masts associated with concerns about the impact of electromagnetic fields on health, in an urban environment in Wallonia. The emission norms for EMF had been decided at the federal level, setting the standards for antennas emitting electromagnetic waves to ensure that no adverse health effects caused by heating can occur. Non-thermal effects are not addressed as they are considered as not scientifically funded: they are "not-yet- known's".

The case study on Bisphenol A (BPA) analyses the recent dynamics of cooperation between the European and Belgian authorities (and their scientific bodies) with reference to the recent ban of the use of bisphenol A in baby bottles.

Chronic risks (*e.g*. air pollution)

For chronic risks, risk assessment is quite developed: there is much information available and discussions about the risk assessment become quite stabilised. Nevertheless, the saliency of the risk on the political or social agenda is never stable (it goes up or down the ladder) and new scientific information on e.g. air pollution may place the risk in another frame. There is continuity between chronic risks, new available information and the shift on the political agenda. The risk management is also and above all a question of mobilising the political agenda. There can be an effect of the communication and media attention on the risk perception and on the judgement on seriousness or tolerability of risk, according to the type of framing that is put forward. Other issues which are at the same time on the political agenda have an influence, *e.g*. for 'air pollution' there is competition with the agenda of 'climate change' but at the same time, decisions taken for climate change will also have an impact on the quality of air in city. Air pollution is a "free rider" and takes opportunity in this particular case.

The case study on air pollution analyses the policy networks engaged in the measures to curb the concentration level of particulate matters in the air. While a lot of scientific evidence is already available on the health impact of air pollution, Belgium is still at odd with the current European regulations on this issue.

Post-crisis risk management (*e.g*. soil management)

Risk assessment is developed within a stabilized (or at least stabilizing) politico-administrative framework. There are networks for information (risk assessment) and for decision (judgement on the tolerability or the seriousness). However, the framing of the issues and its corresponding management is not fully stabilised. The management structure, the decisions on the tolerability of risks or the choice between options of management may be designed during a crisis period (the 'Mellery' case in Wallonia and the 'Love Canal' case in the U.S.A. where chemical waste was in large quantities illegally dumped near a city). Risk assessment and management can be a continuous process. With evolving time, new choices can be made for management (*e.g*. the model of risk based land-use management by SPAQUE).
After a crisis, the issue remains on the political agenda: *e.g*. governments underline the need for new usable land for industrial activities. Clean up of soil contaminations is still high on the political agenda (with high funds available). Over time methodologies can be modified: new models are developed as tools to assess

the cost / benefit for clean up decisions and ranking of priority sites. Such models are also linked to specific framings of the issue.

When looking at the dynamics of risk assessment and risk management (Figure 1) it is obvious that the different steps within the process for risk governance do not always follow the full circle, nor do they always follow each other clockwise.

The case study on soil pollution analyses the dynamics of cleanup of an historical contaminated (with heavy metals i.e. cadmium and lead) industrial site, under the responsibility of a regional authorities.

2.1 Applied methods in the case studies

2.1.0. General approach case study analysis

A bottom-up approach was used to get an inductive insight on the mediating processes which occur and might explain how policy-making cases built up (or not) from their point of departure – the problem justifying the setting of the risk management on the public agenda – towards a desirable final state (acceptable risk). The focus is on the chain of events and the policy network related to an observable outcome more or less in adequacy with the desirable one.
For the fieldwork, we investigated different sources, mainly written policy documents, media and qualitative data to describe the dynamics of the expertise process. Qualitative data have been collected by semi-directive face to face interviews. The idea was to let the actors free to inform us on how they perceive the problematic and the way it is managed by public institutions.
A critical question is raised by qualitative and inductive research. Since the "grounded theory" by Glaser and Strauss (1967), much has been written about being open to what the case has to tell us and slowly evolving toward a coherent framework rather than imposing one from the start. The need for developing a grounded theory exists in tension with the need for clarity and focus as there is a risk of producing a bulk set of data.
A preliminary framework was drawn early but revised repeatedly. It was centered on the following research questions: what are the actual practices in risk assessment and management? Are any of these consistent with an integrated and comparative approach? Do they validate a central hypothesis about the feasibility and usefulness for policy-makers of an appraisal framework mobilizing an integrative and/or comparative risk analysis?

2.1.1 Importance/performance analysis & closed discussion room

This type of analysis is applicable for evaluation of decisions/actions and seeking solutions for complex technical, scientific, policy or social issues. Initially key players, related to the issue, were selected. Written consultations and in depth interviews were performed to elicit information on the particular domain (Burgess *et al*., 1998; De Marchi *et al*., 1998). Based on this knowledge, actions were distilled for an importance-performance/feasibility analysis (Alberty and Mihalik, 1989) via an internet poll. After analysis of the data, results were displayed at a workshop, attended by a small group of invoked persons (Pereira *et al*., 2009). Results of the poll were used to channel the workshop and topics were openly discussed. It was not the goal to come to a consensus but each opinion was important. Benefits of the followed procedure were: a) the creation of a safe place for information transfer to stimulate an open communication between participants; b) it was a joint learning process from which results are applicable for future scenarios; c) this kind of interaction yields more nuanced and precise information than a scoring poll alone. The whole process (interviews, discussions at workshop) was coordinated by a chair or facilitator, who was also responsible for the reporting.

2.1.2 Delphi

The *Delphi*-method (Brown, 1968) typically takes a panel of respondents through consecutive rounds of consultation, throughout which subjects of consensus and/or dissensus will occur. The participants are informed about the results of the former round so as to involve them in a learning process. The facilitator is the only one who has access to all the answers. He organises the questions for each round, taking stock of the statements proposed during the previous rounds by all participants. In order to have a direct access to a large panel of respondents, and to make participation as easy and appealing as possible, a web-based version of the *Delphi*-method called *Mesydel*, designed in our research center (SPIRAL), was used. *Mesydel*, as a consulting interface, has the benefit of combining qualitative data gathering with large response groups. (ref: www.mesydel.com).

2.1.3 Open process workshop for assessment framework validation

The open process workshop is an interactive and qualitative method allowing the present stakeholders to identify their positions and functions in a specific decision making process (e.g. Figure 2), to understand the positions and functions of the other stakeholders and finally to force mutual understanding.

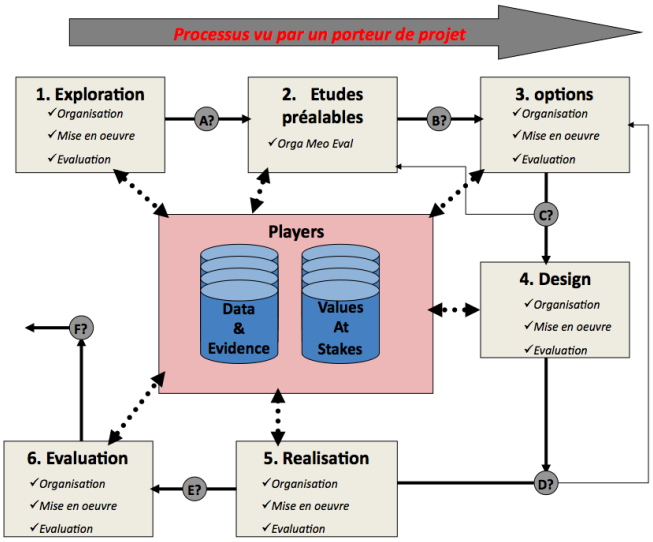

Figure 2: Setting an assessment framework for decision making.

The decision making process was presented under the form of a public management project, giving attention at each step - from exploratory initiatives until the end-of-project evaluation- to the mobilisation of the relevant stakeholders, in order to ensure a cooperative dynamism. Persons from different stakeholder groups which had been identified during the field work (scientific, civil servant, telecom industry, NGO, citizen) were invited and were then asked to identify their own position within the process and evalutate the whole assessment framework.
The confrontation of the stakeholders revealed some important characteristics in terms of stakeholder identification, openness of the decision framework, cooperation rules and spaces leading to the construction of "referentiels" (Muller P., 1990). The case studies provided the research teams with a series of dimensions to take into account in the decision making process.

2.1.4 Group discussion room

Participants received a list of issues (risk related) which were very broadly presented by a facilitator. These issues are then discussed in group. People were asked to prioritize issues for attention by public authorities and justify their selection. Questions are asked in an interactive group setting where participants are free to talk with other group members. This group discussion room goes much further than a one-to-one interview. People can be studied in a more interactive environment which stimulates their thinking. The ‘group effect’ (Lindlof & Talylor, 2002) causes a chaining or cascading effect in which one answer feeds another question or discussion.

2.1.5 Scenario workshop

The methodology of the scenario workshop is described in APPEAR (2005). In this case it was used to study the group dynamics and to experiment with the framing issue of a specific policy issue. At the start of the workshop, participants received a set of unnumbered scenarios. The scenarios described in general terms what the basic philosophy and principles behind the scenario was, which key aspects should be taken into account, and which potential negative issues were noted when implementing the scenario.

In the workshop-session, two observers were present and a facilitator leading the discussion. Participants were asked to read the scenarios carefully, with the possibility of asking technical questions. They had to note their preferred scenario and the scenario they would like to reject. For those two scenarios they had to write down their motivation on a yellow, respectively red post-it.
Everybody was asked to state their preferential and rejected scenario, and was asked to stick the post-it on a blackboard, while giving their argumentation. Based on the distribution of opinions, a discussion was started to look for an optimal scenario.

2.1.6 Strategic management model

The case studies offered an empirical base for the development of a normative scenario in order to provide end-users with an analytical tool helping them to identify the critical phases of the DMP - and the analytical and deliberative tools needed - and to design a DMP combining a process-oriented version of the precautionary principle with an integrative and comparative methodology. This combination calls for a governance process, involving the most relevant range of experts and stakeholders starting at the earliest stage in the DMP in order to avoid the pitfalls of less comprehensive or later involvement.
This framework relies on some assumptions which make theoretical and empirical sense as they get support from our case studies and are validated by the results of our previous research. These assumptions are:

1) In a precautionary perspective, the quality assessment of the uncertainty management should be investigated by the process rather than by outcome as “in the long run, good decision-making processes are more likely to generate good outcomes” (Keren et al., 2003).
2) An integrated and comparative approach stands as an obligatory passage point to improve the quality of the DMP at each step.

3) The two first assumptions entail opening of the decision making process with a participatory approach (Stirling, 2005)
These assumptions got some direct support from our case studies. Still, a scenario performing these three assumptions raises questions about the practicalities of its implementation at each step, its feasibility and utility. Several experimental settings were organised in the SCOPE project to test the feasibility (section 2.2)

Given the critical nature of scientific uncertainty, and of public acceptance of risk policies, the design of a precautionary method implies developing interactions from e.g. administration, corporate interest, and civil society in their struggle for problem solving (goal formulation; choice of instruments, implementation) in a governance model helping develop a shared vision. Acceptability of the decisions will depend on the extent that the wider public has confidence in the procedures. A strategic management model charaterised by following procedure (Exploration; Preliminary studies; Definitions of the options; Design of the project; Realization; Exploitation or Follow-up) was used (see Figure 2).

This analysis allows to

- Identify the stakes and stakeholders (bottom-up)
- Formulate transversal questions
- Question systematically the adequacy between the sequence and the tools of participation and evaluation
- Identify the loops of feedback

In the model of strategic management (Gerry and Scholès, 2000) the actors are invited to discuss the dimensions of the issue at stake, the long term objectives of the project considered and the means proposed to attain these. It means that all actors are actively involved in anticipation and in supporting the decision making process within a common frame, generally with a leader in charge of steering the process. In order to adequately integrate all the dimensions, it is necessary to develop **integrated and comparative** approaches through the management process. We draw a distinction between integrated and comparative methodology. Both methodologies have a different focus and activate different cognitive processes but are linked through a circular process. The **integration** methodology involves a delimitation of the relevant attributes of the risk with a strong accent on inclusiveness of the risk attributes. It aims at reducing uncertainty about the limits of the problem raised by the target risk. Integration has a first prerequisite: the adoption of interdisciplinary expert practices among scientists and among experts consulted by policy-makers. Another prerequisite of the approach is the adoption of participative tools to question and widen the scoping and framing of the issue at stake. On the

other hand, the prioritization process (**comparison**) and in particular a participative method about risk ranking aims at eliciting an informed, socially shared and explicit vision of the political willingness to allocate a part of the scarce resources to get to a given and commensurable result across risks and/or options of mitigation for the same risk. Prioritization can be seen as a key moment of a strategic approach of risk policies – proactive, future orientated with the awareness of the complexity and the turbulence of the environment.

2.2 Case studies

2.2.1 Controversy on ElectroMagnetic Fields (EMF):
between a linear, sequential and procedural risk regulation regime[3]. Analysis at European, Belgian, Walloon and local level.

The study of conflicts arising at the moment of the implementation of GSM antennas reveals that implementation processes are not just conflicts of NIMBY (Not In My Back Yard) types, a clash between private local interests (promoted by inhabitants) and public goods (antennas network insuring the good coverage for mobile phones). These conflicts are also socio-technical: they raise several issues in the domain of science as well as around societal issues, in a changing political context.

The political field legitimates a public action, which imposes the political authorities to rethink the conditions of political decisions and instruments, in terms of specific regulation tools as well as in terms of changing cognitive frames. There are not only issues related to spatial planning (as it occurs very regularly for implementation issues), but questions are being asked also about the health impact of the antennas. Each stakeholder (either public or private, either local or regional, either expert or not) being part in the process (whether in terms of analysis or in terms of management) brings forward a specific framing of the issue.

This part of the research[1] consisted of (i) a literature study of the way in which the cases were handled by experts, policymakers, *etc*., and communicated to the public, (ii) in-depth and focus group interviews with informed stakeholders involved at the different level of the process, (iii) a focus group on questions related to the risks related to EMF for human health and (iv) an in depth analysis of the dynamics of the

[3] This document is a summary of the PhD thesis of Geoffrey Joris, 2011, Un médiateur invisible. Analyse et mise en perspective du régime de régulation des ondes électromagnétiques, Université de Liège - FNRS.

local controversy at Marcinelle (Charleroi) around the siting of a new GSM antenna. The open process workshop (see section 2.1.3) was used to test the appraisal framework in the EMF case study.

The analysis of the multiple levels of decision making in the domain of EMF risk management showed that the use of the precautionary principle often was equated with the need to open the process in order to increase the plurality and frames. Each actor contributed to shape the risk regulation regime but the analysis showed the absence of a central actor. **At each level (between the local and the European level), a different "*acteur-pivot*" has been identified**. Actors seemed to import their own framing of the issue, adapted to the specific institutional setting at each level of decision making. Also, ending the controversy cannot be done by pure scientific arguments, as the issue is still under scientific uncertainty. Neither can the political authority use a simple argument in term of public interest. The risk assessment and management instruments to be used in the risk regulation regime should be analysed carefully at each governmental level as they have to adapt to the specific configuration of actors that is active at that level at a given moment.

Internal limitations are noticed when new patterns of participatory governance are developed to implement precautionary procedures. Literature studies show that the use of the precautionary principle leads to two major adjustments in the decision making process: new criteria on the social acceptability of technical developments and new procedural patterns of public decisions (Groux, 2005; Pidgeon *et al*., 2005). Some analysts propose to redefine procedural patterns in order to reinforce the legitimacy and social appropriation of public decisions which, in the context of uncertainty, cannot rely on the authoritarian use of scientific knowledge and technical expertise. The idea behind the **opening of the decision making process** is to achieve some form of co-construction of a common knowledge base in terms of technical expertise and social participation.

The analysis of the local conflict in Marcinelle showed that local authorities are still very far from understanding this rationale, and unable to innovate in terms of more open procedures in order to lead to more acceptable decisions.

At the level of the Walloon Region, the two innovations proposed by the minister (the use of the PIR *"Projet d'Intérêt Régionaux"* and the conference of stakeholders) did not lead to a reflexion, let alone to a change in the way decision making was executed. On the contrary: the instrument used is very traditional (norm setting) and leads to immediate contestation.

The precautionary principle was only seriously put forwards at the European level, but in this case, the issue for the Commission was to build its own position in the field of public health issues and therefore to maintain a good cooperation with WHO and its expertise (which was based extensively on the ICNIRP experts; ICNIRP, 1998). To ensure a good cooperation and to align its position to the WHO, the Commission used the precautionary principle in a version dramatically driven to the scientific side: restriction to action should only be taken when there is a scientifically confirmed concern for public health and this was not the case for EMF. Only further research was funded and new reports were published on a regular basis.

The analysis showed that some instruments can be used at several policy levels but at each level, the same instrument has to adapt to the political setting. For example, the WHO norms on level of exposure are used at the European level, by DGSANCO in order to expand its expertise and legitimacy in public health issues, according to the "spill over strategy" analysed by Massé & Richards (1996). The same norms, at the Belgian federal level, contribute to the institutional game, fostering a lecture of cooperative federalism with the regions, while in Wallonia they contribute to support the action of the government and help the building of a regional identity. Finally, at the local level, these norms are instrumentalized to reassure the inhabitants and prevent contestation. **This analysis showed how the norms, developed as a precautionary approach, are reinterpreted at each different political level in order to better integrate the local institutional and political environment**. In most cases, when this principle of precaution is put at the foreground, its use is mainly symbolic and incantatory.

An appraisal framework was developed (Figure 2), and the decision making process is presented under the form of a public management project, giving due attention, at each step - from exploratory initiatives until the end-of-project evaluation- to the mobilisation of the relevant stakeholders, in order to ensure a cooperative dynamics and a precautionary logic: the objective is not to achieve a zero-level residual risk , but to organise a risk regulation process where uncertainties are being co-constructed and managed in a acceptable way.

This presentation was validated under the form of an open process workshop (see section 2.1.3). We proposed to decompartmentalize our discussions with the actors involved in the appraisal framework by inviting them in a common experimental setting. The attention of the participants was concentrated not on the points of divergence but on the processus: the actors eventually use different frames but

they nevertheless are associated in a common risk governance network. During the discussions, the participants underlined the importance of developing a common understanding of the "rules of the games"... which they found adequately presented under the form of the sequention AF. The participants very easily identified their own involvement in this AF presented to them by the researchers. They also identified as critical points in the process the intermediate moments organising the participation of the public. They identified a series of political issues which they place above the AF, embedding this within a larger political frame (issues related to sitting criteria; patterns of contextualisation; the ethics of technological development). The participants identified how central the step organising public participation was in the process: a hinge between the project definition and the implementation step; this is the step where the differnt frames are confronted. At the same time this step if often considered as marginal by the promoter, but several questions were directed to the adequacy of the practicalities: organisation of space and time, competence of the actors, type of information exchanged).

The discussions showed that the setting of the workshop help the participants develop a comprehensive approach of the process. It also helped the researcher identify the different roles of the scientists, the administrators, the promotors and the NGO's in this file. An analysis of the OPW as a moment of "performance" has been proposed in a second step by Claisse and Joris (2011). The production of the performance supposes an interaction between the researcher and the participants, and between their respective propositions. This exchange can be confronted to the model of "double hermeneutic" proposed by Giddens (1987): the information provided by the research (the AF) modifies the "social" (the participants) and the participants provide themselves their knowledge of the social. The knowledge which emerges on the board during the workshop is performed through the intervention of the researchers together with the guests. This performance is considered as an artefact, not a representation of a reality which would "already there": the question of the representativeness of the knowledge produced through the performance becomes then meaningless: it is not a question of veracity (description of a reality out there) but a question of felicity (ambition of a future realisation), if we refer to the terms of Austin. This argument then questions the real outcome of the workshop: if veracity is not the criteria for validating the performance and if only the engagement itself is important for the researcher, should we conclude that "everything does"? The researcher is invited to critically consider at the same time the condition of the performance and the capacity of the actors (researchers or participants) to always consider the real as the horizon.

2.2.2 Case study: Air pollution a complex risk

Flanders – policy evaluation

This study aimed at improving the communication between policy makers and researchers in order to reduce air pollution by particulate matter and improve public health in the future (Buekers *et al*., 2011). This study was in collaboration with researches involved in the PM²TEN study (Particles, Mobility, Physical activity, Morbidity and The Environmental Network project[4]). The study used a kind of backcasting scenario focusing on 10 years of policy and research on PM10 (particles with aerodynamic diameter < 10 µm) in Flanders to create a platform for decisions for achieving the European PM2.5 (particles with aerodynamic diameter < 2.5 µm) standard in 2015 (air quality directive 2008/50/EC). The method used was the importance/performance analysis and safe discussion space (see section 2.1.1).

Goals of this study were to a) promote the interaction between researchers and policy makers engaged in the domain of air pollution at present, b) synthesize lessons learnt from PM10 and how to apply these for PM2.5, c) create a safe space to extend the relations between research and policy for future scenarios. This last issue was a practical application of the recommendations given by Pereira et al. (2009). A “safe and authorized place”, i.e. a regular forum, where researchers and policy makers can engage in constructive dialogue and consolidate collective trust is necessary for knowledge integration.

Following context or state of affairs of the Flemish air quality policy motivated the study: a) the daily average PM10 standard was more than 35 times exceeded on a yearly basis and b) no exemption for not achieving this standard was given by the European Commission.

The workshop has confirmed an observation made during preparatory interviews: in the domain of air quality policy, public servants communicate well with researchers from scientific institutions. The protagonists in Flemish air quality policy have a common scientific background and are technical experts, no matter if they are working as public servants or as researchers. Indeed, the experts share the same technical references, but they play different roles. The results show that the researchers and policymakers involved share attitudes, general policy recommendations and technical expertise, and that their common challenge is to

[4] http://www.belspo.be/belspo/ssd/science/projects/PM2TEN_NL.pdf

get more control of the communication and information transfers to decision makers and the general public. This observation puts into question a common discourse postulating that there is a ‘communication problem' or 'gap' between 'researchers' and 'policymakers', without specifying the institutional affiliation or job description of the actors covered by these categories. This discourse as a description of a state of affairs does not suit empirical reality, and needs to be reformulated in more precise terms. If there is a communication gap, it is not to be situated between public administration (‘policymakers’) and researchers (‘scientists’), who communicate well and share the same overall concerns, but between public administration and ministerial cabinets.

Systemic risks characterized by complexity require the **collaboration between different stakeholders and the interaction on several levels**. The communication exercise described in this study, included a collaboration of researchers and policy administrators and expected a large input or effort but resulted in a fruitful discussion on the policy and research topics on particulate matter (PM) air pollution in hot spot Flanders.
The exercise consisted of a research poll based on an importance-performance/feasibility analysis followed by a closed workshop to guarantee a safe place for discussion by key players and resulted in following conclusions. Some unresolved issues remained, like the location of the present monitoring stations in Flanders, where historical, and technical aspects play a role, but also where the roles of different administrations influence their position. It is a conflict that can be resolved with installing new monitors or when health based standards are refined at EU-level. An adherence to the standards requires more pro-activity, and this is understood differently: in the context of taking (precautionary) measures opportunities are missed (use of diesel cars), in the context of European standard setting, too little knowledge is transferred, not only scientific but also contextual (Flanders as a densely populated area). In the field of knowledge improvement, research programs on PM should be better coordinated with collective synchronization and based on a long term vision. This knowledge should be open to public in such a way that it is useful for reflecting and the preparation of PM policy and research. In detail, more research should take place to e.g. determine the sources of primary and secondary PM and gain more information on the PM composition and its influence on public health.

Wallonia & Flanders – decisional spaces

This section concentrates on the problem of management of air quality (AQ) and of the policy aiming to reduce the level of particulate matter (PM) as a class of air pollutants. Boutaric and Lascoumes (2008) analyzed how this air quality issue has recently been epidemiologically defined as a collective sanitary risk in the European Union. Although the European directives oblige the member states to measure and control this pollutant, this issue is not on top of the political agenda in Belgium. Although the problem of PM has, to a degree, matured and stabilized scientifically (the hazards are no longer under question), the problem has yet to become a political issue and find a slot on the public agenda. **Our study gives more insight into how the scientific, political and institutional framing of PM are intertwined.**

PM is a generic term for a vast range of polluting particles with different chemical compounds, different emission sources and different ways of forming (primary emissions or secondary ways of forming). Such a complex pollutant needs a systemic approach in risk management, incorporating different scientific disciplines and crossing over different policy domains.

It follows that the issue of PM pollution does not pop up as an isolated fact. While the issue is coming up, it puts into question options that have been taken in the past, not only relative to the area of air pollution, but also to other political domains such as housing, spatial planning, mobility and transport, *etc*. The study of PM as a chronic problem shows that it sometimes acts as a disruptor of what is thought to be a stable environmental policy topic. Hence the PM problem is twofold: it is a public health problem and it is a transversal political problem.

Two questions were central in this case study: 1) A factual question: how is the problem being treated by researchers and public administrations in Flanders and Wallonia? And 2) A general theoretical question: how does an environmental health problem take form in the grey zone between its status as a subject of European Directives, and its hypothetical status as a national political priority? Can transversal policymaking be forged without prior controversy?

The Directive 2008/50/EC leaves the Member States with an important margin to translate the air quality objectives into action plans. In a federal country such as Belgium, where political responsibilities are largely decentralized, this policy is entirely left to the regions, each of them developing a specific decisional space.

The different authorities of the country (three Regions and the Federal State) have defined their own set of measures to reduce emissions. But the outcome is so far quite meager as the overall daily concentration levels do not reach the European threshold.

Air pollution is translated into a regional problem, measured through a regionally managed network of monitoring stations. At the same time, most fiscal instruments still lay in the hand of the Federal authorities. Such a complex multilevel political and institutional context does not easily support the development of a systemic and transversal approach: different policy domains, some of them still under federal control, have to contribute to a complex set of interlinked measures.
If this fragmented political space poses practical problems for the development of effective policy measures, we have also identified a deeper lying political culture that is common to both regions under study (Flanders and Wallonia) and which renders transversal information flows and cooperation difficult. This political culture consists of a historically waged gap between the Minister and his close collaborators (the Cabinet) on one side, and an administration staffed with public servants on another.

Our research objective was to identify the institutional structures dealing with air pollution in Flanders and Wallonia, to determine the flows of information, and to reconstruct the decisional spaces in both regions. The applied tool in this case study was the Mesydel (Delphi) (see section 2.1.2). Within the *Delphi* consultation exercise, we investigate the possibilities to design a decision making process relying on the interaction between different disciplines and administrations mobilized by the target risk (inter-disciplinarity) as well as on the willingness of policy-makers (and eventually the public) to keep the issue of risk policy open to change.

Most participants of the questionnaire see European pressure as an opportunity to seize and, to some degree, as empowering the administration in the face of political decision makers.

In Flanders, where PM policy developed 10 years ago, a number of key actors from different institutions now have a shared history and show traits of an informal epistemic community (Haas, 1992): a common problem-framing, a priority list, and a shared vocation to inform the decision maker of what is at stake. The Flemish *Delphi* exercise showed a lot of cross-referencing between Flemish institutes as well as many references to one large research institute. AQ policy is prepared,

discussed and formulated between civil servants and scientists (university scientists or researchers from the independent center) within a network structure.
AQ policy in Wallonia is centralized and controlled by one agency, which is responsible for the formulation of objectives and priority settings, as well as modeling and research, and outcomes evaluation. In Wallonia, AQ policy only took form recently, which may in part explain the more linear structure of the policy domain. People cite mainly Flemish and international institutions as their sources of information.

If administrative structures, collaborations, and information patterns are different in Flanders and Wallonia, they still show common features. Regional public servants in Flanders and Wallonia seem to communicate well with researchers from scientific institutions. Our interviews and the Delphi-method enabled to pinpoint the existing difficulties in more precise and different terms. **The communication gap is to be situated not between public administration (civil servants) and researchers, who share a minimum of technical expertise, but between public administration and the ministerial cabinets.** This particular relation has historical roots that we will not develop here (see Goransson, 2008).

Once we had identified the decisional spaces in the two regions, we wanted to better understand the patterns of cooperation between research institutes, public administration, political actors and the public in each region. The participants (researchers and civil servants) were confronted with two models of decision-making (Figure 3).

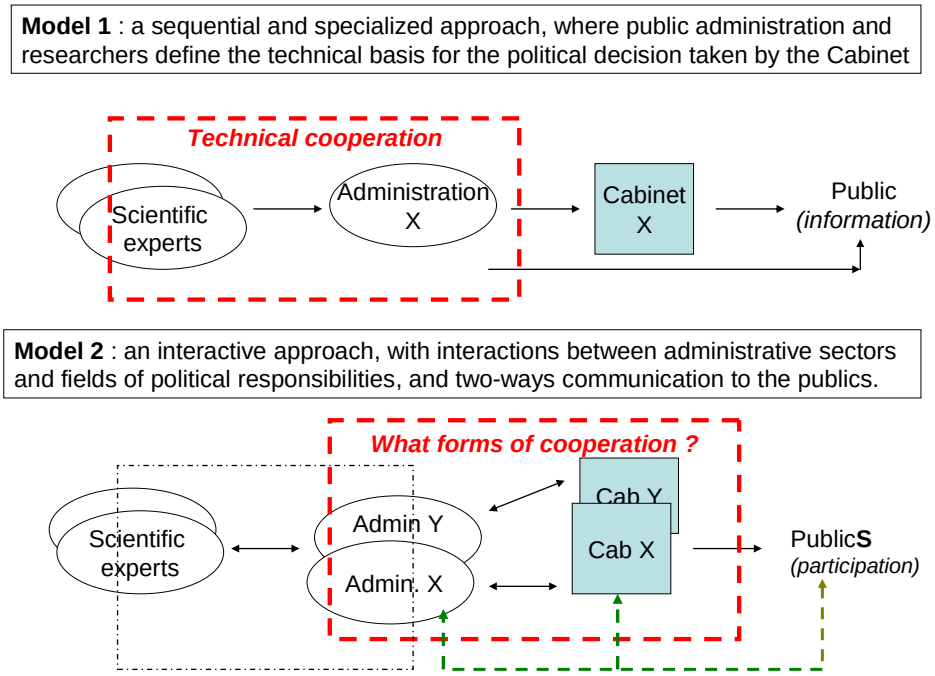

Figure 3: Two models of decision making processes on technical issues.

The first model is linear and sequential, with a pattern of techno-bureaucratic cooperation ending in the cabinet area. We call this the "prevention model" with reference to Ewald's (1996) analysis of the "prevention paradigm" which structured public administration within industrial society: scientific experts inform civil servants while the politicians act as gatekeepers towards the public. In the second model, some of the principles of precaution are mobilized with interdisciplinary approach between scientists and civil servants, interactions between policy sectors at each level of decision making and communication with the public. We wanted to know which of the two models corresponded most to the reality according to each participant, and which model each participant personally preferred. We wondered whether the two different institutional structures of AQ policy in Flanders and Wallonia, would reveal two different decision making processes.

In each of the two groups, a part of the respondents stated that model 1 best resumes the procedure they are used to, and another part pointed to model 2 best putting their experience into a scheme. **Quite a number of them said that both types of decision making occur, depending on the issue at hand**. There is no clear tendency in the relation between the professional background (researcher, public servant) of the respondent and his/her answer. We cannot say that different institutional structures between the two regions lead to a different perception of the decision-making process: while the techno-administrative networks are quite different between the two Regions, the appreciations of the two models are quite

similar. The participant's preferences for one or another model seem to be equally distributed, except for the federal agents who choose model 2: **all respondents working in a federal institution say that the participative model is the one they are most commonly confronted with**. This was new and unexpected information, since our research question focused mainly on the regional differences in policy-making.
As to the preference for using one model rather than the other, many respondents propose that model 2, involving many stakeholders, might be more interesting because of the complexity of the issue. Yet, it is a costly and time-consuming process, and there is very little chance for it if the issue is not already a priority on the political agenda. Cooperation between sectors and policy domains does occur, e.g. in inter-cabinet meetings, but mainly when there is a crisis or a matter of urgency.

The arguments given by the participants to support one or another model are mostly developed through the criteria of rapidity, efficacy, and cost-efficiency. Interestingly, another criterion was brought up by several respondents: independence of the science-policy level. The Delphi exercise confirmed how frustrating the relation administration-cabinet can be from the viewpoint of administration: the decisional logic within the cabinet is not always understood and the outcome is often unpredictable. A better exchange of information is asked for in the two regions.

Model 1, according to some, safeguards scientific-administrative independence and leaves the decision to the Ministerial Cabinet. Several respondents mark the importance of an independent administration, an administration that guarantees continuity as opposed to short-term, poll-driven visions of politicians. The Cabinet is perceived as the extension of the Minister in charge, governed by other rules and criteria than the administration itself. One respondent mentions that the Cabinet has a technically competent staff that doesn't bear trust in its own administration. If the aforementioned perceptions of actors from administration and research seem to point to the necessity of a dialogue with decision makers (as in Model 2), some respondents see the model 2 as a threat to scientific-administrative independence. This leads to the following paradox: it seems that experts in research and administration would like to have more influence on the decision maker (Cabinet), without having to share the same decisional space with the former. Indeed Model 2 presupposes not only a sharing of information and argumentation, but also of power and responsibilities.

Model 2, as we have seen above, not only presupposes a more intensive and articulate interaction between actors from the science-policymaking sphere and the decision making sphere (Cabinet), but also between these spheres and the public sphere. Through the presentation of this model and complementary questions we probed for attitudes towards public participation in decision-making. From the questionnaire, we can make two general observations. Firstly, most participants are critical if public participation means involving any interested citizen. The respondents seem to be more willing to collaborate with organized groups, referred to as 'civil society' in a rational (as opposed to an emotional) discussion. Independent citizens are perceived as being too emotional and also too selfish for most respondents. At the same time, every citizen must be made aware of his share in air pollution, and of how he can contribute to better air quality through behavioral change and attention in daily life. Most arguments of the respondents in our Delphi are developed along the lines of a deficit model of public understanding. The ordinary citizen is seen as the target of communication and sensitization policies, but not as a partner in participative models of decision-making. The reasoning is different with respect to organized groups representing civil society.
Secondly, fairly none of the respondents speaks of public participation in terms of rights or democratic policymaking. Most of the respondents who are in favor of public participation (with critical side notes) refer to public involvement as being strategic to gain policy support from a large societal basis and to gain a stronger say in the decision making sphere. The precondition of this support is a balanced and transparent information flow from administration to the public, and only few respondents state that the flow should move in two directions. In such a configuration, the public is called upon to act as a lever in the relation between the "techno-administrative" pole and the political pole of the decision-making sphere. The public then contributes to the triangulation of the administration domain / political space.
We can conclude that individual citizens or "the public" at large are instrumentalized twice in such a vision: technically, through measures that should lead to changes in behavior, and politically, to gain base support for the technical recommendations of administration in the face of political actors.

Belgium has developed a consociationalist system of governance where interest groups are closely connected to political parties and to the government itself. Such a configuration often occurs in socio-economic policy fields, were the representatives of social partners are associated to the policy developments in a closed arena the access of which is controlled. In the domain of environmental policy, the authorities have only recently engaged into more participatory forms of

policy making, under the pressures of environmental NGO's and grass roots organizations. Recent evaluative analysis (Bruyninckx, 2002) showed that these new bodies do not have the same standing and possibilities to influence the government: "The traditional interest groups (employers organizations and labor unions) are still rather dominant in the process. They are heading most of the new consultative bodies, and more importantly, they are still dominant 'when things really matter'."

We probed for the possibilities in two different regions of developing a transversal approach, open to the public, on a more structural basis for issues that may be in need of such cooperation. Although no-one within the response group objected to the idea, a lot of practical problems were pointed out such as the time and costs involved in such heavy collaborative approaches (as we proposed in Model 2). **One might say that the benefit of a collaborative approach is a more transparent, communicative, qualitative and accountable form of decision making due to the transversal policy approach and the involvement of stakeholders - a procedure which could create better conditions for good decisions under uncertainty** (Keren and Bruine de Bruin, 2003). **But the huge resources to be engaged in such procedures might limit its efficiency.**

Although most respondents seemed to favor a transparent approach and a clear communication towards the public and other stakeholders, a number of answers pointed to another difficulty, in terms of autonomy. Administration and public research institutes commonly defend their autonomy and pointed to the risk of losing it if the decisional space is to be shared with the cabinet (model 2). When dealing with issues that would need scientific and political deliberations at once, how must administration and the political arena interact? Several civil servants positioned themselves as the guarantors of continuity and long-term vision. Many researchers express a similar concern and propose new instruments such as impact assessment and modeling in order to evaluate existing measures and propose new ones. Indeed, if the techno-administrative sphere wants to reaffirm its role, new policy instruments are a way to make its messages cross the border to the political sphere (Lascoumes and Le Galès, 2007).

Organising integrated and comparative risk management in emerging issues in Belgium is complicated by the very specific nature of the Belgian polity and the strength of the particracy controlling large ministerial cabinets. Many analyses tend to underline the differences between the two main Regions of the country but the

fieldwork showed that these two polities are still structured by similar governance mechanisms.

Pushing up emerging issues on the political agenda is very difficult, in the absence of techno-political crisis. The two last major crises on environmental issues (soil pollution in Mellery in Wallonia and the "dioxine" crisis at the federal level) made possible not only the uptake of the issue by the political system but also the transformation of management practices. The SPAQUE agency was established after Mellery; FASFC (Federal Agency for the Safety of the Food Chain) after the "dioxine crisis". Both crises put the precautionary principle somehow higher on the agenda and gave a stronger impetus to new forms of cooperation thanks to these strong agencies.

The limited communication between administration and cabinets makes it difficult for endogenous experts to push issues on the political agenda. At the same time, exogenous agenda setting with the support of NGO's and the media is restricted by the active gatekeeping organised by the political parties and the social partners in the consociationalist system of governance. In the last decade, consultation processes were organised with social partners and NGO's on environmental issues, but these negotiation spaces are still powerless in Belgium.

There is only a low probability of a change coming from the political parties themselves, as a new issue on their agendas. A crisis is necessary in order to see the "cooperation craftsmen", those working in the parties or at cabinets level, engage in creating new transversal structures to engage on emerging issues. The "dioxine crisis" in Belgium revealed this kind of dynamics. The energy needed is particularly high to engage on issues that are in conflict with the political priorities: air quality as opposed to economic growth and mobility. A crisis provides a strong enough impetus to pass an "activation barrier" and create new cooperation structures, as the techno-political crisis of the dioxine have shown.

Such crises are quite rare in Belgium for air quality: only a recurrent media discourse pointing the extent of the epidemiological consequences of air pollution could provoke some modification on the political uptake of the issue. European policies tend to exercise some pressure, albeit quite soft, in this direction. At the moment of "translating knowledge in action", every choice, even the ‘purely technical’ ones, attributes roles, borders and different spaces for administration, politicians, cabinet associates, NGO representatives and the public and needs political support to achieve this.

2.2.3 Case study: soil pollution in Wallonia

The soil cleanup case (Fallon et al., 2008a) illustrates a decision making process where the interfacing of the different public actors – the agency in charge of the cleanup and the different competent public authorities and experts - operated an integrated risk analysis of the potential sites as well as a prioritization of the sites to be cleaned up. The adoption of an integrative and comparative approach has been facilitated by the presence of a "leading" and durable actor – the regional Agency **SPAQUE**. The Agency was settled in 1991 to manage the first large and controversial pollution in a regional dumping site (Mellery). An autonomous agency was then considered a good solution to handle such new unstructured issues, with enough flexibility to organize new networks of experts and new forms of expertise. Such an agency has more latitude to react quickly and engage in large projects in a proactive way having as sole obligation the reporting to the administrative board of funding regional authorities. This was made clear when the authorities decided to organize a large campaign of toxicological analysis in order to evaluate the degree of contamination of the population around the site: **most participants reported that the leading role of the agency acting not only as recognized expert but also as a focal point for the communication between authorities, external experts and stakeholders was a condition of the observed success**. The role of citizenry in influencing or making the decision has been limited if not non-existent.
Still, the lack of public opposition to the cleanup program does not mean that the communication strategy adopted by local authorities and fostered by the Agency's procedural design is the outcome of a fully integrative and comparative approach by the agency. Social uncertainty about the existence and the seriousness of potential countervailing risks of the risk management has not been reduced. For example,
local authorities forbade the residents to grow vegetables in their gardens but the countervailing risks associated to this regulation have not been identified although these restrictions have had a large impact on the local community.

In soil decontamination, the political agreement on the prioritization of the sites paved the way to the Agency to organize a large clean-up program and release new urban areas for socio-economic use. The Agency was left with an extended latitude while the legal framework was quite relaxed, as the regional authorities had not yet approved the final regulation on the matter. The interviewed experts all recognized that the absence of standard did not delay their work as cooperation and communication within and outside the Agency, and even internationally, were timely organised and left time and space for mutual controlling, checking and questioning the different approaches. This procedure led to timely consensus on sets of values to be referred to by the experts when they had to organise in depth characterisation of the

contaminated site and to evaluate the risk factors for the environment and the local population.

This Agency (with the support of the regional government) has used its margin of manoeuvre in order to create a new management process based on an integrated and comparative approach including a rather limited but at least participative approach of the issue.

We used a strategic management model with the identified sequences for the project or program (Exploration , Preliminary studies; Definitions of the options; Design of the project; Realization; Exploitation or Follow-up; see section 2.1.6) to analyze the case.

This analysis was presented to two groups working at the NGO "Interenvironnement Wallonie" which were working on this question at the local and regional level, in order to get their feedback on our conclusions.

The soil cleanup case under study illustrates a decision-making process where the adoption of an integrative and comparative approach has been facilitated by the presence of a “leading” and durable actor – the agency – who got the skills and more broadly the resources needed to enter into a learning process fostering inter-disciplinarity. This agency has developed over the years a very large expertise of open communication to the public, e.g. for long term follow-up of contaminated dumping sites. During the strategic priority setting, the communication with the public was the responsibility of the political authorities, but the agency was inserted in a new decision tree associating several ministers, administrations and expert centres: **the idea was to design a structure of communication between the numerous partners on the issue of health – environment – territorial development. This structure was considered as a success by all the partners.**

From the comparison of the soil case study with other studies, we concluded that the success or the failure of a decision-making process in scientific uncertainty is determined by the following points:

1. The problem should be recognized as relevant within the scientific and the political sphere
2. legitimate actors should be clearly identified
3. association of the actors from the start of the process , also during the definition of the “rules”
4. flexibility of the negotiated rules
5. recognition of each actor with his specificity and his legitimacy and lines of actions
6. policy of transparency and openness to criticism

7. need for places for social discussions between the stakeholders
8. identification of legitimate experts or reference points available for all actors
9. identify social mobilization processes (who is launching the alert; who is mobilizing; what is the framework used by the local groups “réalité ergotique”)
10. the role of media for primary mobilization and for information

2.2.4 Case study: Healthy cities

On the 13th of January 2011 SPIRAL and VITO organised a scenario workshop in Brussels. The workshop was focused on “healthy cities” and intended to build further on the experiences from the air pollution Delphi-online method (see section 2.2.2). The invitation was sent to stakeholders involved in the Delphi approach, extended with a wide variety of stakeholders with a natural, social or economical science background, people from health and environment administrations, and socio-economical actors. In the invitation people were asked to engage in a reflection about sustainable projects in an urban environment, with an emphasis on health and wellbeing, and mobility.

The method used for in this case study was the scenario workshop (see section 2.1.5). Considered scenarios were: incrementalism (a cautios reactive urban development; Lindblom, 1959), implementation of low emission zones LEZ, implementation of overall sustainable quarters, the use of health impact assessement for policy evaluation and voluntarism for a change in city planning. The considered scenarios were intended to focus on different political/social/economical levels to promote an integrated approach. The scenarios were shortly worked out before the workshop and described in general terms what the basic philosophy and principles behind each scenario was, which key aspects should be taken into account, and which potential negative issues were noted when implementing the scenario.

To enable an open discussion, the group was split up in a French-speaking and Dutch-speaking part. This would also offer the opportunity to observe and compare different group dynamics on the same issue. A summary of the most important opinions and of the group dynamics is given below.

Flanders: opinions & outcomes

Environmental policy in Flanders is built on incremental and opportunistic steps, and there is nothing wrong with that. What is needed is a long term vision. Participants felt that this is lacking. Currently, in the best circumstances, voluntaristic policies are put in place when there is e.g. competition between cities.

The implementation of low emission zones and sustainable quarters were seen as concrete measures (not a real scenario) or a tool. Current politics are in an incremental phase and a shift to a more voluntaristic phase can be performed by applying these concrete measures. Also the use of a health impact assessment to evaluate policies was a step to go from incrementalism to more voluntarism. When focussing on the air pollution problem, the fact that current European standards are exceeded more times than allowed, the lack of a longterm vision and the impact of air pollution on health show that a more voluntaristic scenario is necessary.

It was observed that the group's opinion was pretty much aligned and that a strong diversification of opinions and background was lacking. Involvement of political mandatory's in these type of experiment (but also in real life) would greatly advance the theory to practice. It was also observed that the participants did not know exactly how local politicians think, what their motivation might be.

Wallonia: opinions & outcomes

The individual appreciation of the proposed scenario directly put on the side the development of "Low Emission Zone": this instrument is considered as too local and too limited on a very specific dimension, the mobility issue; the possible impact in terms of health improvement is very limited.
The "laissez faire" scenario was rejected because of the absence of political vision: the participants underlined the importance of tackling the sources and causes of current trends and their impact on the quality of life of our cities.
The scenario recommending the construction of "Sustainable areas" received a strong support just above the scenario proposing the use and generalisation of "Health Impact Assessment" as a procedure imposed for all new projects. For the time being, the health dimension is not enough taken into consideration in the impact studies: *"the procedures give more attention to the protection of frogs than to the health of humans"*. The "Volontarist" scenario was more polarised: supported by some members and rejected by others, with as main argument the cost -political and economic- and the risk related to a too rapid transformation and the risk of top-down development.

When discussing the different scenarios following dimensions were proposed to be integrated:
- be ambitious and develop proposals for short term - mid term - long term, while being careful to integrate all relevant dimensions. Avoid the "quick fix".
- inform the policy makers on the health impact of the living conditions
-organise adequate structures of participation for the citizens (adequately with regard to the different levels, from the local project up to the development of regional plans). Extra cost and time due to participation should be considered as minimal.
- develop structures of communication to generate the social support of the public and organise the forms of co-construction of the alternatives with the stakeholders, avoiding top-down approaches..
- organise concrete measures, with economic investments, in order to make visible the political engagement and the new orientations (e.g. by supporting the development of sustainable quarters).

Plans and tools should be developed to define long term orientations in urban/rural development of the region. This kind of planning must be organised with the participation of stakeholders, thanks to the development of participation tools in accordance with the level of decision making.

The arguments mobilised by the participants of the workshop were mainly geared to the importance of participation (and of engaging the stakeholders in the process of city development); the necessity of organising integrated - interdisciplinary approaches and to organise the links between the different levels of action and planification.

2.2.5 Case study: Bisphenol A

The issue at stake for this case study, was to analyse the structures and processes of communication between the different actors of the governance network as well as the link of the governance network to the public at large, either via NGOs or other formal structures, or directly through media communication.

The hypothesis behind this analysis is the importance of the communication structure for the construction of trust in the risk governance system (Fallon & Joris 2009a & b). The governance network should be able to organise common modes of action and should also build social representations identifying not only the problems at stake but also the actors legitimate to handle them and the logic of their interventions. Muller (2005) calls such a social construction a "référentiel sectoriel

d'action publique" which results from the common construction of instruments of public action within a specific sector of public responsibility. Applied to risk governance, such a "security referential" would result from communication structures and activities, which convey values, norms, images, and logics contributing to frame individual and social perception.

This case study was selected as the public at large was directly concerned, as consumer on the market. We posed that it would be possible to identify the communication structures in this sector of risk governance in which new political decisions were reconsidered[5]. We wanted to identify what were the main actors in the governance network and the processes of communication between these nodes of the policy network as well as their involvement in communication activities to the public via the media. This can bu used to evaluate the potential contribution of the communication structure to the construction of a referential accepted widely in the public, which would ensure the technical efficiency as well as the social acceptance of the logics of governance in this domain.

Background

The Belgian food safety authority (FASFC) released a position in 2009 in relation with BPA[6], with consideration to the effects as endocrine disruptor. The Committee concluded that "*Le BPA a une action œstrogène faible... Les effets du BPA à faibles doses sont sujets à des débats scientifiques*".
In terms of hazard identification, the Committee underlined the impact in terms of chronic effects due to long term exposure. It also stated that children should be considered "at risk" because there are relatively more exposed than adults, at a period of development of their neural-reproductive and immunitarian systems.

In 2009, the European Commission asked EFSA to consider new evidence on the neurodevelopment effects of BPA (study from the American Chemistry Council). The 25 experts designed by EFSA also contacted other national bodies (US Food and Drug Administration, Health Canada, Food Standards Australia New Zealand, Food Safety Commission from Japan) as well at the WHO and replied in November 2010 that there was no evidence to reconsider the position on BPA. The conclusion underlined the importance of strong scientific evidence before considering the need

[5] **The interviews were organised in early 2010, several months before the decision taken in november 2010 to ban the commercialisation and use of baby bottles with BPA in Europe.**

[6] Avis 29 – 2009 du Comité Scientifique de l'Agence Fédérale pour la Sécurité de la Chaîne Alimentaire: Risques chimiques émergents – Étude de cas : les perturbateurs endocriniens (9 octobre 2009)

to evaluate the position. It also refers to its mission of scientific monitoring (according to article 34(1) of the regulation 178/2002) for emerging food risks: "*cependant, si de nouvelles données utiles sont rendues disponibles dans le futur, le groupe scientifique reconsidèrera l'avis actuel*".

In Canada, in 2009, the government banned the importation, sale and advertising of polycarbonate baby bottles made with the BPA monomer[7]. In January 2010, FDA (U.S.) proposed reasonable steps to reduce human exposure to BPA in the food supply[8]. The report on risk assessment by the European network of excellence, the CASCADE research team recalled the position of EFSA risk assessors: there is currently no concern for human health in relation to most effects at current exposure levels. However, due to inconclusive and contradictory results, further information and/or testing concerning effects on development was needed. It also refers to the need to consider low-dose effects. (ref: www.cascadenet.org)

The interviews we had with scientists and experts in Belgium underlined the space of controversy between EFSA and other positions:
- current limits are based on two studies performed by the same laboratory working for the industry;
- EFSA only considers the studies which can show they certify the use of "Good Laboratory Practices (GLP)" – What is de exact definition of GLP and is it not easy to say that experiments were performed by GLP?
- questions were raised on the considered rats used in the study
- what should be considered: the dose of the product or the duration of exposure

Political framing at different levels

At European level, several policy domains are concerned with BPA: Cosmetics Directive; REACH; Food Contact Materials Directive; EU Endocrine Disruptors Strategy.

In Belgium, the authorities rely mainly on the European position. There were several questions asked by the representatives at the federal parliament[9]. But the

[7] Évaluation des risques pour la santé liés au bisphéol A dans les produits d'emballage alimentaire – Santé Canada – Août 2008

[8] Update on Bisphenol A for Use in Food Contact Applications – U.S. Food and Drug Administration – January 2010

[9] Senat belge - 4 mars 2004 – Question au Ministre des Affaires sociales et de la Santé publique et à la ministre de l'Environnement, de la Protection de la consommation et du Développement durable sur « les effets nocifs possibles du polycarbonate ».; 4 septembre 2008 – Question à la vice-première Ministre et Ministre des

authorities repeatedly put at the fore the position of the European authorities, framing the issue only in term of food contamination through packaging[10], while other dimensions could also be mobilised (e.g. by including BPA in the REACH directive; or in a strategy on health and environment, dedicated on the control of endocrine disruptors).

The issue of the endocrine disruptor effect of Bisphenol A (BPA) has been underlined with a stronger stance in the case of polycarbonate baby bottles[11]. It is considered that migration from packaging into food is increased by heating (particularly in micro-wave use). Most of the exposure is related to migration into food[12]. BPA is permitted for use in food contact materials in the European Union, under Commission Directive 2002/72/EC relating to plastic materials and articles intending to come into contact with foodstuffs. At European level, EFSA revised in July 2008 the position taken in January 2007, strengthening the level of daily intake (down to 5 μg/kg).

Some countries decided recently to ban the use of BPA in baby bottles (Denmark called for a ban in May 2009; in France AFFSA sent "warning signals" in February 2010).

Belgian authorities[13] rely on the analysis provided by the EFSA (2006, reevaluated in 2008 at the request of the Commission). The position of EFSA considers that current norms are stringent enough, also for infants. On 3/7/2005, a Belgian law

Affaires sociales et de la Santé publique; jeudi 23 octobre 2008 – Question à la vice-première Ministre et Ministre des Affaires sociales et de la Santé publique, à la Ministre des PME, des Indépendants, de l'Agriculture et de la Politique scientifique et au Ministre du Climat et de l'Énergie sur les « dangers potentiels de certains produits se trouvant dans la «Boîte Rose » remise aux mamans en maternité »;

[10] AR du 11 mai 1992 concernant les matériaux et les objets destinés à entrer en contact avec les denrées alimentaires. La réglementation belge s'appuie sur la directive 2002/72/CE de la Commission des Communautés européennes du 6 août 2002, qui règle l'emploi de BPA dans la fabrication des matières plastiques et plus particulièrement de polycarbonates.

[11] it is also used in polyepoxy applications (in fact in plastics identified as n°3-6-7): in alimentary application (inside films in cans; plastic box for microwaves;alimentary films; , and in non-alimentary applications (toys; dental cement; skin contacts with printing inks;)

[12] ref: Cicolella A., 2010, Le cas du Bisphénol A, Conférence : Questioning HEALTH Expertise, Deficient Evaluation & Conflict of Interest (European Parliament Brussels, 4 March 2010).

[13] Sénat belge - jeudi 23 octobre 2008 – Question à la vice-première Ministre et Ministre des Affaires sociales et de la Santé publique, à la Ministre des PME, des Indépendants, de l'Agriculture et de la Politique scientifique et au Ministre du Climat et de l'Énergie sur les « dangers potentiels de certains produits se trouvant dans la «Boîte Rose » remise aux mamans en maternité »;

"*relatif aux matériaux et objets en matière plastique destinés à entrer en contact avec les denrées alimentaires*" transposed the European directive (2002/72/CE) to fix the limit of migration to BPA. Controls are performed by the federal food safety Agency (FASFC). All samples on polycarbonate bottles showed that concentrations measured were below the migration limit. (A proposition for a ban of BPA use in all food packaging was proposed at the Belgian Senate on 23/3/2010[14] but led to no discussion, as the government felt apart some weeks later).

The Belgian position is deeply rooted in the European one. A member of a political cabinet stated that Belgium does not want to contest the European system on food safety and to make *ad hoc* decisions on specific products. The political position is to respect the decision taken at the European level.
The administration of the file is under the responsibility of the SPF Public Health, with one expert mandated to follow the discussions at the European level.

In 2010, several decisions were taken during the Belgian presidency of the European Union. In November 2010, the superior health council was asked to answer to several questions in relation to the BPA and the need of banning its use in baby bottles. The Belgian minister in charge of public health decided to advice the consumers to not use baby bottles with BPA anymore. Then the "Standing Committee on the Food Chain and Animal Health" decided, on a proposition of the Commission, to not follow the position of the EFSA and to definitively ban in 2011 BPA in baby bottles.

Communication

The main nodes in the political network were easily identified as most of the interviews pointed to the same important actors:
- European level: EFSA and the European Commission
- Belgian level: Federal Agency for the Safety of the Food Chain (FASFC), Federal Public Service (FPS) on Public Health, Superior Health Council, Scientific Institute for Public Health (SIPH).

EFSA works in a network with the national authorities as well as the European Commission. At the European level, EFSA publishes its decision on the website, with the full information on the composition of the Committees and the content of

[14] Sénat belge - 23 Mars 2010 – Proposition de loi modifiant la loi du 24 janvier 1977 relative à la protection de la santé des consommateurs en ce qui concerne les denrées alimentaires et les autres produits, visant à interdire le BPA

their positions. The Commission also publishes information, particularly on the research projects which are funded by the Framework programme for research and technological development (e.g. www.cascadenet.org).

The European Commission which is in charge of defining the options in terms of risk management (e.g. to ban bottles with BPA) takes the decision in close cooperation with the national authorities, through the "Standing Committee" where a representative of the FPS on Public Health represents the Belgian position.

The Belgian Agency FASFC is mainly in charge of organising the control of residues of BPA in food and it does not communicate a lot to the public on this issue. The role of communication of FASFC is limited to the items which are according to regulations, and to well defined problems and hazards. But it does not issue communication nor publish data on issues were the positions are not well defined... as this is the case for most emerging issues with uncertainties as in the case of BPA.

The Ministers in charge of public health and of consumer protection worked together on the issue of BPA and asked the Superior Health Council to consider the questions (report of 3/11/2010) of banning the use of BPA in packing in contact with food for infants 0-1 and 0-3 years old. The council was also asked to legitimate its position with reference to scientific evidence. The Superior Health Council gathers Belgian university researchers, with scientist from the SIPH: this is a very small world and the Belgian experts (French & Dutch speaking) know each other very well and are much used to work together.

The Scientific Institute of Public Health (SIPH) organises workshop and research; it also publishes scientific reports but the communication to the public at large is under the control of the federal administration, the FPS on Public Health. External communication by this FPS is controlled by the President of the administration and a specific team in charge of the external communication which reports directly to the president of the administration. This is very controlled, as compared to other structures, e.g. the CRIOC (Agency in charge of information on the consumers) is open and has the right to communicate on his own studies without referring to the federal administration.

While the communication by the Belgian administrative bodies is carefully controlled by the FPS Public Health, the communication by the political representatives seems to be limited because the issue does not attract a lot of interest in the public. There

are some parliamentary questions but the intervention by NGOs or the public to the politicians on the issue of BPA is limited. The politicians recognise that there is no strong involvement of the NGOs or of consumer associations on this issue, as this was the case in Canada or in France.

The scientific researchers underlined the importance of scientific communication on the BPA. A lot of articles are published every year on the issue. Some of them are funded by the industry, with a risk of bias in the analysis of the uncertainties.
The communication of the scientist with the media is more limited: there is still a lot of concern of the experts to speak to journalists as they tend to consider that the media language does not fit their own vision of the form of message to transmit to the public. On the side of the journalist, they have to get specialised to have the time and expertise to cross check their informants and to have enough knowledge of the issue to put at the fore the uncertainties and the dimensions of the controversies (particularly on issues such as BPA). New networks tend to be established between the scientific journals and the general media, with new international press reviews made available also from medical and scientific journals. This was made clear when the results from the SHAPES project (financed by BELSPO) were put in the general media not via a direct communication by the researchers to the general press, but after the publication of a scientific article on this project and a large mention of its conclusion in the general press in other countries.

The industry and economic actors are the most involved in communication activities, first and foremost through the publicity. They also publish much information on specific issues directed to a wide audience (e.g. http://www.bisphenol-a.org/ website is financed by the chemical industry). When confronted to new concerns expressed by the consumers, they tend to turn this concern as an advantage: this was made clear through the emerging campaign organised by some producers: "bottles without BPA" already months before the ban was decided on BPA.
As stated above, experts from industry also discuss the propositions of regulations and norms with the administration. On the question of banning BPA for baby bottles, there seemed to be only limited opposition expressed by the industry. Many scientists underline the importance of their link with the industry: the later provide them with research funds, which are precious when public funds are decreasing; the researchers also consider that these contacts are important to help diversify their expertise by working closely with industrial researchers.

For the media themselves, the uncertainty about the impact of BPA on health is very difficult to be communicated to the public. Although the issue of health (and particularly of health risks for the baby) is considered a good subject in the press, the presentation of uncertainty and the controversies between experts limit the possibility of communication: the messages are unclear when different respondents develop different positions on the same issue or when the different political authorities (on health and environment; European, Belgian, or regional) have divergent positions. Dramatisation is often used as a mean to increase the salience of the issue in the media but this is hampered by scientific controversy.

Public management without agenda?

In case of Bisphenol A, the analysis reveals that the issue was put shortly on the political agenda, with very limited public debates. There was no crisis situation, no NGO pressure or no strong image to move the media. So, the decision was taken at the federal level to ban BPA in baby bottles, but the issue was only marginal on the political agenda in Belgium. Belgian authorities preferred to rely on the Commission and EFSA was considered in charge of the question put on the European agenda by the new regulation on BPA in Denmark and France. As was said in an interview: "*we wait for the European position*". The European agenda seems to lead the national governance process.

The structure of public communication on the issue of BPA seems very limited, strictly controlled by the administration, while the industry develops large means to convey the message that current regulation is conform scientific knowledge and is fully respected by the industry in order to protect the consumers' health.

There is little chance that such disequilibrium into communication (industry controlled) and in decision (delegated to the European level) could lead to the construction of a framework for public action in Belgium supporting trust in the national governance structure.

2.2.6 Case study: Setting of an appraisal framework

The Group Discussion Room was organised with the Members of the Follow-Up Committee on 14/12/2007. The intent was to launch a structured discussion with potential users of an appraisal framework which we were working on, in order to test some of the hypothesis of the SCOPE project (which dimensions of a risk were of relevance to the decision makers?).

The participants had received a list of health related risks (e.g. exposure to radon in house; earthquakes; soil pollution), very daftly presented, with an estimation of their Seriousness, Uncertainty, Cost for Action. The method used was the group discussion room (see section 2.1.4). Nine areas were presented in which public intervention could be fostered. Participants were asked to think on arguments/objections for supporting/opposing an intervention in a specific area.

Mainly the different social actors around the table agreed that the two main criteria's on which decision makers have to base their decision on are: the **seriousness** and the **corroboration.** Right after comes the question of **budget** that was, in this case, illustrated by the dollar per DALY (Disability Adjusted Life Year).

The perception is not well understood by the actors. They do agree that the social perception has to be taken into account but not under the determination "perception". It is actually more the question of the "**outrage**" that should be taken into account more than the social perception. By dealing with outrage, the issue that is mobilized is the "**problem framing**". First the problem should be framed and the different social issues should be drawn in order to let the politicians put the decision making process and of course the different solutions in a context.

Perception is an important dimension for public action, either it is too low (e.g. radon in house) or too high! When perception is low and seriousness is high, the authority has to organise a media campaign which might not be well received by the population (*people do not want to see the problem in their garden*). Perception is an important dimension for short term issues (e.g. for crisis management) but not so much for long term issues.

Which people do we consider as relevant? Some stakeholders might have high concerns why the general public has none.

The question of the **time period** to be considered (short term or long term) is important when comparing the issues and this is should be presented in the appraisal framework.

Another dimension is **prevention as opposed to remediation**: the levels of intervention might be different when it is for a new setting or for an old one. For example, defining norms for new buildings is not very costly, but afterwards, building modifications are much more expensive.

The question of framing is very sensitive to the term which is considered:

- Before elections, policy makers like to have actions taken
- Perception too often is high on very short term issue (it is "event related")
- "Of course we have to consider such an approach as a long term exercise, not in a crisis situation: this way of thinking is maybe necessary."

The **data** take a huge place in the argumentation and in the legitimization process of the decision. "*There is usually a lot of information behind such data: I have to make sure that all these info is trustworthy!"* In order to play their suited function, some indications about their **reliability** should be mentioned. According to the different social actors, this reliability has to be understood by some standards of presentation (charts, statistics, graphs *etc.*) but also by mentioning **where the information comes from**. It is not necessary to have all this information available right from the start, a simplification of the information is absolutely necessary, but this information has, at least, to be available and accessible. **Having access to an easy to understand presentation is very helpful!**

The discussants insist on the **importance of context** in the decision making process. The start of a decision making process has to be understood as the starting point of a process but it has also to be seen as the end point of an other process that makes it possible to exist. In other words, a decision making process takes always place in a particular context. This last one has to be pictured to the decision maker. The context in which the decision has to be taken should answer to the following questions:

- Are they already rules dealing with the problem? At what level?
- Is there some evaluation of these rules?
- Who is the target of the rule? (→ social construction of the target)
- Which level of action should be more appropriate to deal with this question? (→ question of efficiency and efficacy)
- What is the outrage produced by the problem?
- …

The question of communication and the role of the **media** campaigns is a crucial issue for the social actors. There is of course a difference between mediatization and a media campaign. The first one is inherent to the political game while the second one is a voluntary action taken by the decision actors in order to implement the decision. Some information should be given to the decision

maker about the way his decision should be implemented. And the AF can help in choosing the adequate instrument.

The social actors plead for a comparative risk assessment based on scenarios that would evaluate and balance different options on one given type of risk (including information about the efficiency and the efficacy of options). So according to them, the first step, is to:

- Framing the problem: consider it as a policy issue
- Identifying some scenarios and the policy options
- Discussion about the scenarios and the alternatives
- Decision
- Implementation

3. POLICY SUPPORT

3.1 Policy recommendations on the process of decision making

In the current classical policy cycle, there is an *ad hoc* approach in which well structured problems are translated via well defined pathways into policy actions. The policy cycle starts with putting a specific policy problem or policy option on the agenda, followed by the evaluation of different alternative policy options, the policy decision and the implementation of what has been decided. Finally, policies and their implementation need to be monitored, evaluated, from which an iteration can start that takes into account the outcome of the evaluation and can result in correcting or changing the policy or in some cases the development of new policies (Figure 4).

In case of **complex** issues, there is a lack of structure, which can cause a failure of the current decision-making process. The chaotic stream of information and the time pressure for certain environment and health issues enhance this failure. Moreover, policy intervention may even be part of the problem because many policy measures have a wide range of side-effects: "*When the full range of potentially important effects is not considered, serious mistakes can be made in policy development*" as the policies on bio-fuels illustrate (Knol *et al*., 2010).

A new model with a **central role for the administration** is necessary. Tasks as managing and controlling the network and the available information are considered. At the same time, the necessity of an **organized participatory model** is proposed as the approach for current input of the midfield organizations is insufficient. It was observed that the opinions of individual citizens enter the policy cycle relatively late, which may form an obstacle for the decision-making. **Early and organized stakeholder input** can help to focus the analysis and to improve stakeholder confidence in the decision-making process. Handling complex issues requires new ways of thinking and operation: ways that are **broad in scope** (social, economical, policital, *etc*.), more inclusive in content and more **collaborative** in nature (Knol, 2010).

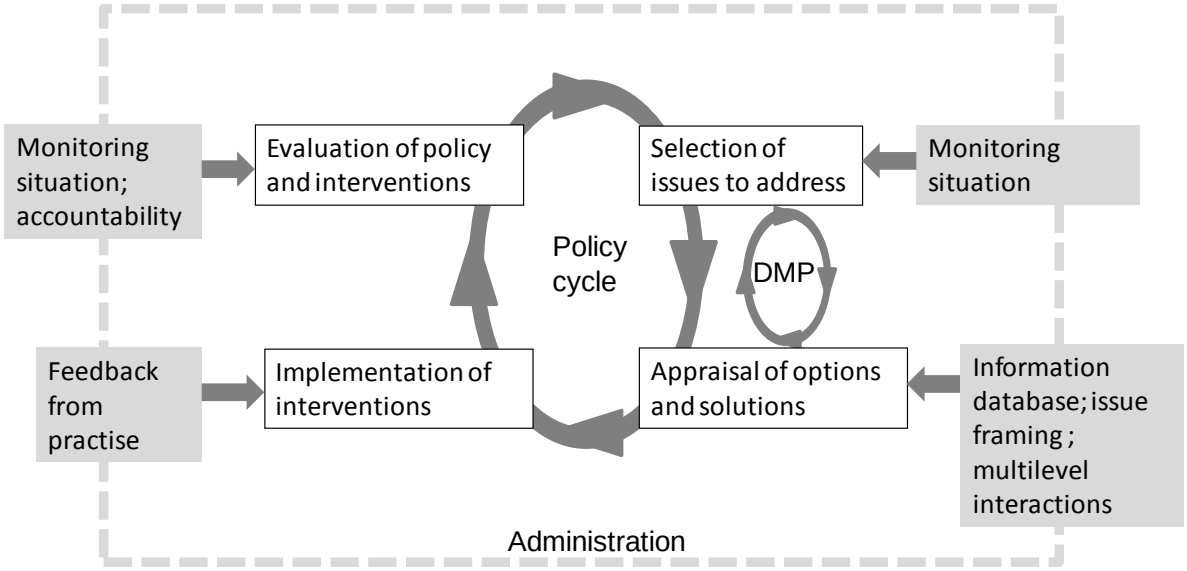

Figure 4: Policy cycle. Adapted from Eva Kunseler (presentation "Policy Framing of Environment and Health assessments" at INTARESE). DMP stands for Decision Making Process.

The decision may be taken in a certain degree of uncertainty. Therefore, interventions may have a preliminary character. It is necessary to monitor interventions in such a way that an adjustment of the policy is possible related to the development of scientific knowledge. Also changes in the social context (e.g. change in risk perception, controversies in a society) may cause a policy modification. In this precautionary context, the policy cycle becomes **iterative**. When a decision is made under uncertainty, the quality of the decision relies on the quality of the process, not on the outcome itself. The underlying assumption is that, "in the long run, good decision processes are more likely to generate good outcomes" (Keren *et al*., 2003). In line with this, we consider that appropriate structuring of the decision making process (DMP) itself helps a lot in the final quality of the outcome (do we reach a technically sound and socially acceptable solution?).

These general remarks are an important motive to search for new policy and decision-making models. While many concepts exist it is a matter of making it operational in a prescriptive way: it is possible to define a set of **guidelines** to decision makers and stakeholders about handling the process at the different steps in order to improve its reflexivity.

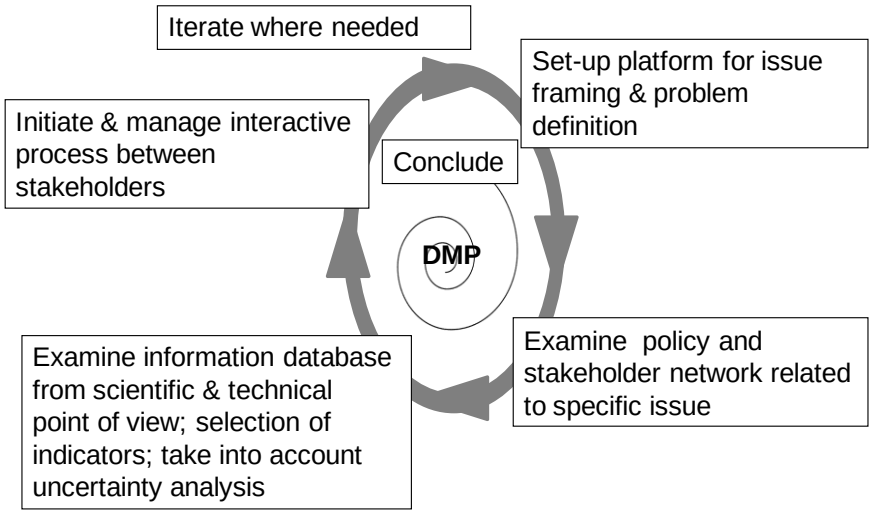

Figure 5: Decision Making Process (DMP) drafted based on case studies. Schedule can be used as recommendations for new issues. Participatory process is a continuous process that should be integrated along the entire DMP.

A representation of these recommendations is given in Figure 5. Concretely, these recommendations advise to pay attention to the role of a focal point in the process, potentially taken up by public administrations, to the co-production, availability and organisation of knowledge and information, and to the progress of the process.

1) Set up a **platform** for issue framing and problem definition to highlight key factors that need to be assessed by using a set of guiding questions (Briggs, 2008).

   1a) Define the characteristics of the problem in a **systematic** and **transparent** manner.

   1b) Examine the policy and stakeholder **learning network** related to a specific issue, with special attention to policy domains that are affected by or are affecting the environmental and health issue at stake. Specify who has interests in the issue and who should be involved. An efficient stakeholder network analysis is important for the further progress of the DMP. For uncertain and transversal issues it's recommended that the network covers different administrations, scientists, consulting offices, companies and civilians (in social organizations).

   1c) Examine the **information database** before setting up a more integrative approach, both from a scientific (including uncertainties) and technical (alternatives, CBA analysis) point of view and from the side of concerned

stakeholders. Policy makers acquire information from different inputs from science, stakeholder organisations, socio-economic actors and the public at large, as well as from administrations and staff members, and are conscious of the structural and constitutional constraints. It is clear that a **balanced process of information gathering** that is transparent, contributes to better decision making.

2) Initiate and manage the process: find out who will carry the process, set up a series of **interactions** between administrations, between administrations and cabinets, between administrations and research, between administrations, research and the public. Usable and meaningful available information on the issue should be communicated clearly to all stakeholders. It is innovative to look at how stakeholders **increase their knowledge** through different inputs and through communication, information and interaction.

3) Iterate where needed: information gained in one dialogue should be fed back into other *fora*. An equilibrium between acceptability – tolerability – uncertainty should be established.

4) Move forward / conclude. In the total policy cycle (Figure 4) the conclusion or decision may be revised, when (1) monitoring of implementation and following evaluation is considered as negative ; (2) new knowledge / experience / issues have to take into account.

Tools which may be applied to analyse decisional spaces, evaluate policies, build scenario's out of different alternatives are all presented in section 2.1. These may be completed with the VIWTA overview on participation methods (2005).

3.2 Lessons learned from case studies and workshops

1. Is the transversal approach across administrations necessary?

Complex environmental health risks, embedded in a wider political, economical or social context cut across the traditional policy-making structures, policy fields and policy levels. Co-ordination between those areas is crucial to ensure complementary policies, rather than single conflicting measures, in realizing environmental health objectives. It is important to find effective ways to work together on shared policy issues where competences (and hence rule-making) are split across the different administrations. Other risks, which are more clearly defined, can be dealt with within one sector or policy area. The OESO (2010) report on better regulation in Europe – Belgium mentioned that '*The different approaches*

to impact assessment across Belgian governments are a rich source of experiences which need to be shared' and 'Where policy issues are shared or overlap, co-ordinated impact assessments for the underlying regulations would add value to the process'.

Some issues that require further shaping by the administrations:

- How should we develop new platforms for cooperation within the administrations in order to support transversal approaches? We propose to organise meetings with a heterogenic group of actors which increases the communication and the knowledge integration (for example gatherings organized between partners active in the domain of Environment and Health in the framework of NEHAP).The objective is to create a platform with different type of actors, with their own specific knowledge/vision. This will open the problem for other disciplines (social, economical) instead of narrowing the problem and discussing it within one administration.
- How should one decide on the optimum between an integrated approach (with more disciplines but also more different framings associated) and an efficient management (the more we are, the more difficult it is to design a common approach)? It is clear that issues with potentially large societal consequences, with a high degree of transversality (many policy domains affected) or where framing of the problem by different administrations deviates from the original problem definition, might deserve an integrated approach.

2. Is there a fluent communication between experts, public administrations and the cabinet?

There seems to be more a communication gap between the public administrators and the political cabinet members, than there is between experts and the public administration. The communication gap between public administrations and cabinets is particularly important as it impedes the transversality and disturbs the transfer of knowledge. The OESO (2010) observes a strong role of cabinets in rule-making or law drafting processes. The proportion of drafts prepared by the cabinets can reach 80%. In all Belgian governments (federal, regions, communities) ministerial cabinets are relatively large and contain a mix of both civil servants and political nominees. In other countries law drafting is usually done by civil servants.

However, moving from this simple observation to a new form of risk management and decision making requires a thorough rethinking of roles, responsibilities and scientific-administrative independence: it seems that experts in research and administration would like to have more influence on the decision maker (Cabinet), without having to share the same decisional space with the former. A more

collaborative model presupposes not only a sharing of information and argumentation, but also of power and responsibilities.

The collaborative model not only presupposes a more intensive and articulate interaction between actors from the science-policymaking sphere and the decision making sphere (Cabinet), but also between these spheres and the public sphere. It should be recognized that individual citizens or "the public" at large are instrumentalized in many cases, to gain support for the technical recommendations of administration in the face of political actors.

3. How should one deal with openness to the public?

In general the public is considered as important, but there are many questions around methods and objectives for larger openness, which implies a cost, is time consuming and demands an effort of stakeholders. More participation may create a larger social acceptance but may on the other hand increase the uncontrollability if not organised well.

Many risk-related controversies and crises are examples of the techno-bureaucratic inadequacy of the legal-rational model in the context of modern risks. In this context, the application of deliberative tools opens the way to a pragmatic approach, supporting the search of consensus through participation of the groups concerned throughout the process. This participation allows mutual learning. Other kinds of answers to the observed deadlocks could be imported from the area of New Public Management[15] and we do not exclude using them. Nevertheless, our framing remains resolutely tinted of a value orientation in favour of a democratic model of public management "more open" to the inter-disciplinarity and to the civil society.

Such an approach opens the way to a greater legitimacy of decisions whose future effects are difficult to foresee – *a fortiori* in the context of the precaution. It encourages a reflection on the manner of combining the opening of the decision-making process through participative methods with others meta-tools such as strategic management, integrated and comparative approach of the risk, or the evaluative method. These meta-tools structure the participative step, giving it objectives, precise questions and *ad hoc* means. It contributes to the technical quality of the decision and to its social acceptability.
Some points of attention:

[15] **New public management** is a broad term used to describe the wave of public sector reforms throughout the world since the 1980s.

- Who are the invited stakeholders? Here one should look further than the formal obligations (advisory boards), in order to identify possible stakeholders while avoiding over-mobilisation of the public. This is a delicate step in the process: the involvement of more stakeholders may also increase the risk of emerging conflicts. Overall a continuous across domain involvement of stakeholders is useful, already starting with the problem framing. Ensure that consultation exercises are launched at an early stage in the process, and in time to provide useful feedback to the government as an aid to decision making.

- As public participation at large can be costly for society, time consuming and may increase the uncontrollability it is advisable to use this type of risk governance (large public participation) very selectively (*e.g*. storage of nuclear waste, large infrastructure works). It is not feasible to include this participation for all risks.

- What is the historical context? Check if there are already available networks and if is it possible to get them enrolled in the process. When opening the process for stakeholders, one should also consider the future: there might be other stakeholders to be associated to the process at another step in the risk governance cycle (e.g. during the implementation phase). This means that selection of stakeholders should be re-thought regularly and not decided once for all.

- The conflicts resolution literature shows that different parties have more chances to agree on the final decision when it is produced according to methods – defined in a protocol - on which they were aligned or better co-produced beforehand.

- As a final comment on participatory issues, we refer here also to the guidance on stakeholder participation presented by the Dutch plan bureau of Environment and Nature (http://dare.ubn.kun.nl/bitstream/2066/46516/1/46516.pdf).

4. How does the public administration communicate?

Communication takes a central role in the risk governance process (Figure 6). Therefore it should be as transparent as possible and it should be evaluated if the communication reaches its wanted effect. Different forms of risk communication exist: press releases, brochures, interactive communication with civilians, participatory processes.

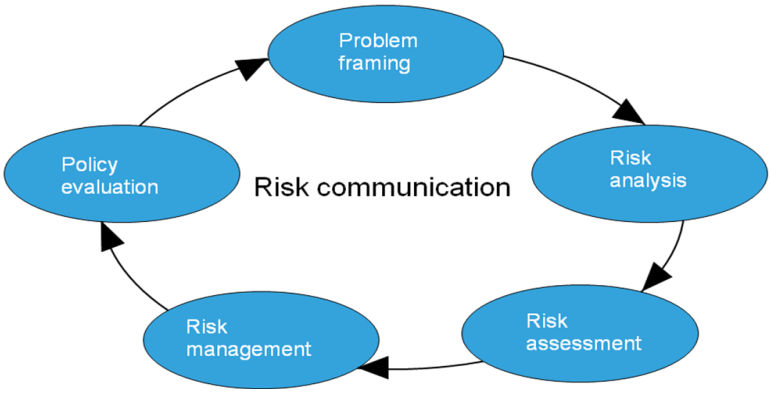

Figure 6: Risk communication central in risk governance process.

One should also take into account following aspects:

- What is the communication goal (informing?; elicitation of knowledge or perception?)
- The content of the communication should in any case be transparent.
- When should the communication take place? In ou cases studies it was obvious that stakeholders want to be informed at the beginning of the process.
- Which communication tool (brochure, press release, *etc*.) will be used?
- Who is communicating and who is the target group? The communication is in function of the target group.

The conventional view does not support interactive communication, whether between different departments within the administration, or between the public administration and the civil society. A uniform communication between different administrations and the public is necessary. Nowadays, with ongoing administration reforms, communication is becoming more developed with the stakeholders when it is requested for e.g. policy implementation (*e.g*. FASFC Federal Agency for the Safety of the Food Chain and the groups of producers). There is a clear shift from one way communication towards a more interactive type of communication. At the same time, the Bisphenol A case study (see section 2.2.5) presented a large deficit of public communication in the case emerging issues: neither the FASFC nor the Federal Public Service on Public Health considered it was their duty to communicate on such a delicate issue (loaded with scientific uncertainties, industrial interests and social concerns when it relates to the health of children or the decrease in fertility). Political communication was limited; scientific communication, although very productive in the specialised media, was only limited in the social ones. Even the NGO's did not mobilise on this issue as was the case in France and in Canada. We concluded from this case that the decision taken in november 2010 in Belgium on the ban for polycarbonate baby bottles was a political decision taken with the support of the scientific bodies (Conseil Supérieur de la Santé) but without being embedded in any social debate. It means that the whole of

uncertainties about the extent of risks related to the multiple exposures to different endocrine disruptors due to the use of consumer products could not be put at the foreground in a public socio-technical debate.

New rules are emerging in the organisation of communication within public administration, particularly in order to organise partnerships. Important aspects that need more attention:

- How to develop interactive forms of communication with the media? Media are not always "stakeholders" when expected. They are very much present during a crisis but less after it. The communication with the media should be better organised. Late communication, press leaks may have a large influence on the public perception which may hinder the risk governance process.

- How should communication with the public take place via new forms of "social networks"? In such forums, it is possible to hear the expectations of some part of the public.Who should be the rapporteur of these expectations? How can public administrators and experts take part on this dynamic of interactive communication with the public on an individual level?

5. What is the importance of European decisions in a multi-level socio-political space?

A lot of risk assessment is performed at European level (particularly for the emerging issues such as risks related to the use of mobile phones and the presence of bisphenol A in baby bottles). The epistemic networks (linking international scientific rings and public administration at the European level) are different from the politico-administrative networks which locally manage the problem.

In a multi level approach, we see that the decisional spaces are structured along different lines at each level. The conflict on the competent authority for the risk related to exposure to electromagnetic fields is a good example. At the European level, the framing used for risk assessment (in the European Commission) is not the same as the framing used at the federal/regional level. We see in this case of EMF a pro-active action of the Flemish authorities relative to the European authority under the framework of the precautionary principle. There is in any case a discrepancy between the information mobilised at the European level and the political local frame for action. Is seems necessary to tune this process for risks for

which a passive reaction takes place.

Either on risk or on technical innovation, there is a need to build on the lessons learned from the work done on the social dimensions of science and technology, for example in the area of "Science, Technology and Society Studies". Science and technology are embedded within a society and its web of institutions (Jasanoff, 2005). Local appropriation of a technology needs the development of adequate institutions (Rathenau institute in the Netherlands).

6. Is there an adequate *ex ante* evaluation of proposed policies?

In 2007, the federal government implemented a sustainability test for major political decisions (OESO, 2010). The sustainable development impact assessment (SDIA) was defined as a process for the examination of the possible social, economic and environmental effects of a proposed policy. Originally the SDIA was also developed as an instrument for encouraging co-ordination and co-operation across the government. The SDIA aims at evaluating the impact of a proposal on: (a) current and future generations; (b) social, economic and environmental aspects. In the SDIA law drafters (cabinets) can invite experts such as consultants and academics to participate in the elaboration of the SDIA. Unfortunately, the SDIA has not yet taken off (OESO, 2010). It is a formal requirement in the development of federal regulations but has not yet produced any tangible results.

In 2005 the Flemish government introduced a Regulatory Impact Analysis tool (RIA) as a mandatory requirement in the development of regulations (OESO, 2010). After narrowing the broad scope of the initial RIA, the Flemish parliament, the government of Flanders, the Flemish social and economic council and the strategic advisory councils signed in 2009 the inter-institutional agreement for a joint approach to RIA. In this optic RIA should offer an integrated and balanced picture of the potential social impact of the draft decisions and draft decrees within the current field of application, and compare this with relevant substantive alternatives. The agreement stresses the need to define the purposes of the project, to identify alternatives, and to base the analysis on accurate, quantitative information. The RIA includes the consideration of options (at least three: no action, chosen option, alternative option), consultations as well as a specified estimate of administrative costs for all target groups. This RIA tool can serve as framework for risk governance (*dixit* prof. Katleen van Heuverswyn, university of Antwerp; http://www.serv.be/sites/default/files/documenten/SERV_ADV_20110119_nota_risicobeheer.pdf). What are lacking are the risk analysis and the overall impact

evaluation. In the current RIA the impact focuses on the social & economical impact. Also the Flemish note on risk governance related to uncertain risks (Reynders, 2010) promotes the RIA as a possible framework.

7. Is there an adequate *ex post* evaluation of policies?

Little attention is paid to strategic evaluation of programs and policies. The court of audit (covering all governments) plays an indirect and *ad hoc* role in evaluating better regulation policies. Its reports often include assessments relating to the quality of laws and their implementation (OESO, 2010).

At present policy evaluation studies are limited and not embedded in the policy culture. It's one of the main reasons why the expert workshop on air pollution was organized. In this study policies were evaluated in advance of the workshop. Criteria were: (a) is a policy measure important to achieve the current air particulate matter threshold; (b) how did we perform on the policies. The workable format for discussion was evaluated positively by the attendants. In Flanders MIRA-BE offers an overview of environmental policy evaluations. It is an important step towards an institutionalised evaluation of environmental policies. The recommendations in the MIRA-BE 2007 report on a further development of capacities and structures to do so are endorsed by us.

8. Framework for precautionary principle in case of uncertain risks

The innovative aspect of the precautionary principle as a standard of risk management comes from the fact that it refers to a method of decision-making about future action in a context where potential harms remain poorly defined. This situation displaces responsibility for the decision away from techno-science to the political/public sphere and links it to the process of collective decision making. Application of the principle implies the design of a method to help decision makers and other interested parties to make explicit, to interpret and weigh the factors in the light of all the costs and social benefits. For example, what are the costs of added information about nuclear waste management options for research in other fields? Having consequences on the mitigation of other risks this questions the interpretation of the chain of obligations, for example socially accepted trade-offs between intragenerational and intergenerational equity (Okrent, 1999).

In the absence of a method, of a heuristic to deal with scientific uncertainty, explained, discussed and accepted as valid by the various parties *in tempore non*

suspecto, in a non crisis context, the chances are that stakeholders will contest the decision taken in accordance with one or another category of stakeholders. Hence, decision-makers who depend on approval and respect from others to maintain their position (mainly their electors) have no other choice, should a crisis develop, than adopting an overreactive policy under the pressure of outraged citizens/consummers mobilising the precaution and economical actors concerned with the first aid measures to help the sector to survive. They then lean systematically in favor to type 2 error (see introduction), at any costs. In the time of post-crisis, they are left with the most delicate task of deciding who will pay the costs of the measures. This bias is still reinforced when the precautionary principle is evoked: in such conditions of uncertainty, the political authority tends to follow the "safe line", taking conservative decisions, while justifying their decision by evoking the public demand for the control of hazard and an irrational trend towards risk zero.

The current bias on the "safe side" is more the effect of an inadequate DM process than of a the irrational demand of a stupid public. Recent experiences show that the use of participative methods within the decision making process do not lead automatically to a reinforcement of the demand towards risk zero but to another allocation of resources. This is a part of the message of SCOPE : the DMP and the form of AF it mobilises will have an impact on the content of the decision.

The BPA case illustrates the shortcomings of the mobilization of the precautionary principle, of a decision-making process overlooking the combination of a precautionary process focusing on uncertainty management combined with a comparative approach. The decision to ban the incriminated baby bottles illustrates how a risk management measure focusing on the endpoint fails to encompass countervailing risks associated with the other options, for instance baby bottles made of new substances. No comparative approach has been launched to address potential harms associated with different options. The regulative measure is essentially symbolic (the target population are babies), politically rewarding, cheap for industrials. But it fails to close the case, since the decision-making process does not give time for debate on the relevant uncertainties and on the ways to cope with them.

The assumption is that use of the precautionary principle as a standard for structuring the process of decision-making might help get better decisions. The precautionary approach is framed as a method of decision making to be applied to issues in a context of managing scientific uncertainty and, more specifically, an heuristic to assess the value of the current information and the value of improved information to decide among available options. These heuristic factors are the

dimension(s), source(s) and object(s) of uncertainty; the informativeness of added information (the extent to which uncertainty may be expected to be reduced); the cost effectiveness (the probability that improved information might result in a different decision and the resulting net gain(s)); and relevance (the extent to which uncertainty eliciting the precautionary principle contributes to the uncertainty about which decision to prefer) (Hammitt and Shlyakhter, 1999).

Given the critical nature of scientific uncertainty, and of public acceptance of risk policies, a cost/benefit analysis using a precautionary method implies a new structure of relationships between the various actors. This implements a governance model of risk management to create the conditions of a debate on the requirements which have to be respected by the decision-making process if this process is to be accepted by the stakeholders as consistent with a precautionary approach. **What is required is a process which gives time for debate on the relevant uncertainties and on ways to cope with them**. The chances are that stakeholders will not share the same view about the appropriate strategy in a context of scientific uncertainty and will contest the decision taken in accordance with one or another category of stakeholders. The use of the precautionary principle can actually create disruption when it is used to justify costly or ineffective measures. There is thus a need to assess the meaning(s) given to the notion by stakeholders and to gain insight into the sources of variations in such meanings. This implies development of an analytical framework of uncertainty to be used as a grid for questioning and analysing the responses of different stakeholders (Dowe, 1994).

The problem of uncertainty is complex and is made more so given the specificities of the case.

Given the critical nature of public acceptance of risk management policies, the steps of a precautionary method of decision making appear to be:

a. Identify relevant uncertainties and options (go, no-go, etc) needed to cope with them;

- Considering the options, do their potential direct/indirect, cumulative/interactive effects create uncertainties?
- What type of uncertainties?
- What uncertainties are reducible and what are not, without considering the costs?
- This step contributes to make explicit and understandable the different dimensions, objects and forms of uncertainty to the various actors,

probably using co-operative and deliberative procedures (Renn et al, 1993), such as atelier scenarios; future workshops; consensus conferences;

b. Select the means needed to improve our information on reducible uncertainties before choosing the option.

- What uncertainties are both reducible and socially so unacceptable that they legitimate added research costs?
- What would be the relevance, the effectiveness, efficiency of added information?

c. Design the research program and the conditions of the questions and answers production to fit with an approach labelled as precautionary.

- What do we investigate at first?
- Until when?
- How many resources do we affect to the search for more information?
- How do we investigate?
  - How do we take into account the minority positions?
  - The options effects are measured under the most pessimistic and the most optimistic scenario;
  - Scientific knowledge (inter-disciplinarity) and the lay knowledge are mobilised;
  - What are the devices facilitating the diffusion of positions

and knowledge?

d. Plan the monitoring and the evaluation of the residual/reducible uncertainty management process

- What should be the uncertainty monitoring devices (alert *etc*.)?
- To what extent should the option be reversible?
- What should be the devices to evaluate the costs and benefits of reversibility and irreversibility?
- Who will implement these devices?
- Who will evaluate the adequacy of a decision making process to a procedural standard of precaution in a concrete case?

e. Select the option (no go/ go) and – the specific options (go)

- Is the added information relevant, effective, efficient?
- What are the limitations of available knowledge, including an evaluation of the societal dimensions of uncertainty (Nusap) approach)

- Do the potential surprises have been taken into consideration?
- How salient/critical are potential surprises?
- What are the costs and benefits of the different options?
- Is there an option which should be excluded from the comparison because of unacceptable costs?
- What benefits should be prioritized?
- Had the options been compared to each other?
- Who is in charge with the comparative approach?
- Has intergenerational equity been arbitrated against intragenerational equity?
- How does the output of this arbitration is taken into consideration by the decision?

f. Monitor and evaluate the knowledge production

- Has the decision making process complied to the criteria of a precautionary process?
- What evaluation tools?
- Who evaluates?
- Monitor and evaluate *in itinere* the direct and indirect effects of the selected option (reversibility?)

Any prescriptive scenario dealing with uncertain or speculative risks should rely on a shared vision of the precautionary approach. To get to a common referential structure, the surest but not the easiest way is to co-produce it by organising a public debate about the procedural meaning of the precautionary principle. A debate about the goals, challenges, steps of coping with uncertainties if the outcome is to be accepted because the decision making process has been consistent with the requirements of a precautionnary methodology.
Among the requirements of a process oriented approach, the issue of identifying and comparing benefits and the costs of actions and inaction. This examination must take into account social and environmental costs and the public acceptability of the different options and include, when feasible, an economic analysis. A precautionary methodology entails an integrative and comparative approach for the sake of a scientifically sound and socially acceptable outcome.

At evidence, the actual decision-making process is not in accordance with a process whose output would be measures adopted after a thorough and comprehensive (empathic) examination by the various actors of the benefits and costs of action and inaction. It does not takes into consideration **social and environmental costs**, the public acceptability of the different options possible, and include, where feasible, and economic analysis. This examination either is not implemented (worst case) or at least lacks of transparency and social visibility.

Anyway, the public is not given the opportunity to be part of a precautionary approach, while this opportunity is a logical and beneficial consequence of the political significance of risk management in a context of scientific uncertainty combined to the citizen demands for expressive/transformative voice in the decision making process.

The EMF (electro-magnetic field) case study in Wallonia illustrates how the issue of scientific uncertainty is managed by policy-makers. They consider that they reduced to an acceptable threshold the uncertainty of consequences by adopting and applying systematically a conservative emission norm. They failed to get to a shared representation of the residual uncertainty (what do we still not know) and to make it explicit and understandable.

Recently the Flemish administration on environment, nature & energy proposed a note (framework) to deal with uncertain risks (Reynders 2010, http://www.serv.be/sites/default/files/documenten/nota_risicobeheer_2010_05_21%5B1%5D.pdf). In this Flemish note the precautionary principle is centralised: when the possibility for a severe risk exists, scientific uncertainty may not be used to postpone cost-effective measures to prevent the potential risk. The proposed framework will be tested in a pilot study for potential risks related to non-ionising electro-magnetic radiation.

9. Learning network & working together

A risk may not be considered as being stabilised forever: risks are changing over time and the socio-political frame which is in charge of their management should be flexible enough to address the transformations (in terms of risk assessment, of framings, *etc.*); this flexibility is often contradictory to the principles of a bureaucratic public organisation. As risks are flexible, so should also be the management.

In following paragraphs some tracks to build a "learning network" for the appraisal/management are given.

“Working together” is justified by the cross-disciplinary nature of the questions raised by a risk mitigation project as well as by the different framings related for instance to the institutional role of the members of the team in charge with the project (the core group whose participants belong to different public administrations, cabinets, NGOs, *etc*.)

Experience shows that “working together” doesn’t come by itself. It is therefore imperative to put it on the agenda of all those involved during the risk management process, from the outset and to define clearly its method of operation so that it can be integrated into the project’s management culture. There are **two objectives** to be considered:

a) Enriching the interdisciplinary knowledge dynamic

Making people work together means organising their interactions in order to:
- share knowledge rather than hoard it: encourage openness and circulation of knowledge,
- integrate knowledge by co-producing it rather than dividing it: encourage an interdisciplinary approach (integrative and comparative approach),
- allow knowledge to grow through processes encouraging continuous learning based on feedback and audit (change management),
- retain the knowledge acquired and do not erase it: analyse and systematically exploit past experience, positive or negative (efficiency),
- put the knowledge into practice: to be useful, co-produced knowledge must rise above theory,
- transfer knowledge: take it in (learn from others), circulate it round the organisation (comparing ideas, experiences, knowledge, *etc*.) and disseminate it externally at the same time remaining open to criticism.

b) “Enshrine” this method of working in the organisational culture

The diversity of disciplines, knowledge, professional roles multiplies the restraints and obstacles facing “working together”. To overcome these, the core group leading the program (project leaders) must be absolutely convinced of the importance of managing the resources and skills which will enable it to initiate “working together” in a proactive way, implementing it, ensuring its monitoring and learning from it. These are the characteristics of a learning organisation always ready to change its way of thinking and its routines to adapt to an internal and external context which is constantly changing.

Methods which can be applied to enhance the “working together” process:

Generally, building a learning organisation encounters restraints, barriers and obstacles which can bring some of its members to see it as nothing but “another problem which we would willingly do without”. There are methods for sharing the meaning – the why and the how of “working together”, organising and measuring it.

a) Share the meaning

"Working together" is the product of the will of those people wanting to work together and not of a superior authority. Applying this principle rests on the commitment of those involved to a learning process which leads them to take on new practices. This commitment depends on their understanding of issues and their ability to invest themselves.
This dynamic can be top/down (with a directive behavior of a leader: this is what one sees in times of crisis – the project is under threat – or when a leader motivates through charisma, strength of conviction or the energies of those who follow him/her towards the strategy which s/he has clearly defined) or bottom/up (based on collaboration/participation).

b) Organise the "working together":

- Compensate for the counter-productive effect of a bureaucratic structure.

The members of the core group generally operate within one or more hierarchical structure of different nature (administrative, political, NGO, *etc*…). This type of organisation, compartmentalised vertically (hierarchy) and horizontally (fields of expertise represents a considerable obstruction to changes in the practices of apprenticeship characteristic of a learning organisation. The core group does not have the means of changing such a structure, but it is in its power to mitigate its counter-productive effects on the mechanisms for transfer of knowledge, its openness and reflexive nature *etc.* It does this by creating networks and encouraging informal interactions.

- Set the scene for a learning organisation in a proactive way: Allow enough time, a place to meet and encouragement so that those involved exchange ideas and compare thoughts between colleagues, outside any hierarchical bonds. Give the laboratory of ideas the chance to function in reality rather than on paper by encouraging mutual trust.

- Set up project teams consisting of people from different disciplines but working towards a common objective. These help remove the mental and physical barriers to the circulation of knowledge at the same time as encouraging learning through action. Gather individuals from all roles and all levels to exchange new ideas/suggestions on an equal footing in strategic workshops (see workshop on air particulate matter with knowledge exchange between administrators and scientists)

- Improve the training of experts by including actual interdisciplinary experience (the success stories of the learning structure).

- Use coaching. A more experienced partner or the project manager helps others develop new skills, new knowledge and improved performance.

c) Measure the progress made by the learning organisation

This progress is measured in three overlapping stages:

- What is its aptitude in the face of changes to practice and routine?
- What are the changes in behaviour?
- What are the effects on performance?

4. DISSEMINATION AND VALORISATION

A wide dissemination & valorisation of findings in this project took place during the experimental phase. Feedback of relevant results was given to all persons who participated in the social experiments. The SCoPE study led to the formation of a learning network and the appreciation of transversal opinions. A second route for dissemination results of the SCoPE study was via conferences & seminars. Table gives an overview of dissemination activities.

Table 1. Overview of dissemination activities

Activity	Place	Date	Goal
Workshop EMF risk communication	Stresa	2-4 May 2007	Presentation of communication on risks related to EMF
Conference SRA	Den Haag	17-19 June 2007	Presentation integrated assessment frame for decisions on environment and health
Workshop CRA-W	Gembloux	17th October 2007	Presentation on communication in times of crisis
NATO meeting	Birmingham	25-26th October 2007	Presentation Belgian case study on food chain security
Follow-up committee*	Brussels	14th December 2007	Study of setting an appraisal framework
Conference ABSP	Louvain-La-Neuve	24-25 April 2008	Presentation on risk governance and the crisis, media issue
Seminar	Liege	30th April 2008	Presentation on uncertainty on the political agenda
Seminar	Liege	23th May 2008	Partnerships in time of crisis (media - administration)
Conference 4S/EASST	Rotterdam	20-23 August 2008	Presentation on technology assessment in Belgium
Conference SRA	Valencia	22-25 September	Presentation on risks

Activity	Place	Date	Goal
		2008	related to EMF, nano-particles & food safety
Conference CERAP	Brussels	7-8 May 2009	Presentation of the reform of public management, when facing uncertainty
Conference ESF	Bielefeld	25-30 May 2009	Presentation on one best way in science & policy
Workshop air pollution*	Antwerp	23th December 2009	Policy analysis and discussion on air pollution
Delphi exercise*	Flanders-Wallonia	March-April 2010	Reconstruction air pollution policy network Flanders/Wallonia
Conference SRA	London	21-23 June 2010	Presentation on the Delphi about air policies in Belgium
Conference EGAP	Toulouse	September 2010	Presentation on the use of ANT model for the analysis of public agencies
Workshop healthy cities*	Brussels	13th January 2011	Scenario workshop on air pollution in cities
Conference CNRS-PACTE	Toulouse	3-4 February 2011	Presentation on the Delphi analysis of air policy in Belgium
Conference SRA	Stuttgart	6-8 June 2011	Presentation air pollution case study

*: Dissemination activities by experiments SCoPE project

In the SCOPE experiments, policymakers were generally absent, albeit they were invited to take part. In order to come to a more transparent and if necessary transversal and participatory approach of policy issues, it's necessary that cabinets are reconciled with this type of processes. This was already discussed in the overall recommendations and the communication between experts, public administrations and cabinets (see section 3.2).

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ANNEXES

Minutes of the follow-up committee meeting

The annexes are available on our website

http://www.belspo.be/belspo/ssd/science/pr_transversal_en.stm