

Chapter 10

Unmasking Environmental Health Zorros: The Need for Involvement of Real Risk Communication Experts for Two-Way and Problem-Solving Communication Approaches

Hans Keune, Peter Van Den Hazel, and Frederic Bouder

Abstract In the literature about risk communication an evolution can be traced from traditional, one-way and problem focussed communication, restricted to the dissemination of information from experts to the public, to more modern, two-way and more problem solving oriented risk communication, with a focus on participation and cooperation between scientists, policy-makers and the public. Despite advances in theory and numerous initiatives in practice, traditional, one-way communication continues to dominate many attitudes towards the public communication of science as well as practices. Science should no longer hide behind expertism, elitist attitudes and non-transparent black box approaches. Despite good intentions of environmental health experts to help society tackle risks, unmasking these scientific Zorros is crucial to take practice and its practitioners and stakeholders serious. It is time for real professional risk communication expertise to be applied and involved in two-way directional and problem solving collaborations.

H. Keune (✉)

Research Institute for Nature and Forest, Belgian Biodiversity Platform, INBO, Kliniekstraat 25, Kliniekstraat 25, Brussels 1070, Belgium

Faculty of Medicine and Health Sciences, University of Antwerp, Antwerp, Belgium
e-mail: Hans.KEUNE@INBO.be

P. Van Den Hazel

Public Health Services Gelderland-Midden, Arnhem, The Netherlands

International Network for Children's Health, Environment and Safety (INCHES), Dieren, The Netherlands

Health and Environment Alliance (HEAL), Brussels, Belgium

F. Bouder

Department of Technology and Society Studies, Maastricht University, Maastricht, The Netherlands

Keywords Risk communication • Environmental health • Experts • Two-way communication • Problem solving collaboration

10.1 Introduction

In the literature about risk communication an evolution can be traced from traditional, one-way communication, restricted to the dissemination of information from experts to the public, to more modern, two-way risk communication, with a focus on participation and cooperation between scientists, policy-makers and the public (Fischhoff 1995; Leiss 1996; McComas 2006). Traditional approaches to risk communication have often been based on what Wynne (1996) refers to as the deficit model: i.e. the assumption that clear, one-way communication of objective and sound scientific information from experts to the ignorant public is sufficient to make them aware of problems and respond accordingly. In most cases, the science is not simple and consensual, but involves ambiguities and uncertainties. Nor is the public mere recipient of information, but actor in the decision process of the strategies to improve and/or preserve situations and in management of the risks. Reflecting this, obligations for public disclosure of environmental information have for long been promulgated: for example under the Aarhus Convention (UNECE 1998), and through numerous ‘right to know-initiatives’ at local and national level.

Another important challenge in risk communication is on content: how to exchange meaningfully information regarding uncertain, complex and ambiguous knowledge (Renn 2008). How can science formulate confident, robust and clear messages when due to complexity, science struggles with uncertainties, unknowns, and ambiguities? How does the traditional scientific evidence base approach live up to expectations of clear communication and of solving problems without pleading for endless ever more detailed research and without too complicated messages due to lack of clear cut scientific understanding? There is a range of concerns in risk communication. Ragas et al. (2006) challenge the argument that communication should be restricted because of uncertainties, and argue that if the information is used by regulators, public managers and risk assessors, then the public equally ought to know. The belief that the public is unable to deal with complex issues can also be disputed (e.g. Marris et al. 2001). Withholding data regarding uncertainty is shown to often reduce trust (Frewer 2004; Van Kleef et al. 2007). As Slovic (2001) has stated, “The challenge is to communicate the risk estimates so that they are understandable and that the risks and associated uncertainty can be put into a personal perspective”.

Despite advances in theory and numerous initiatives in practice, the deficit model continues to dominate many attitudes towards the public communication of science (Davies 2008) as well as practices. Two-way communication is seen as inherently difficult and dangerous. The alternative view—that two-way communication helps

to make scientists and policy makers accountable and to empower the public—remains in the minority in many fields of science and policy. Much still has to be done to devise and promote more open, yet workable solution oriented approaches to the communication of science, risk and policy, in the context of complexity. In this chapter we will give some theoretical background to modern two-way risk communication combined with illustrations from practice, building on experiences in EU and national environmental health projects, highlighting challenges that after decades are still prominent.

10.2 Decades of Professional Two-Way Risk Communication Advice: How to...

10.2.1 A History of Two-Way Risk Communication Advice

Often cited and therefore important landmarks in the history of two-way risk communication advice are two seminal publications from the end of the last century. First Baruch Fischhoff's '*Risk Perception and Communication Unplugged: Twenty Years of Process*' (1995) elegantly summarizes both the message and its history (Table 10.1—after Fischhoff 1995):

Well, to be more precise, history at that moment in time. Or from a present day perspective we perhaps better call it its potential future as it could or should be, as even at present it still remains a challenge to change the dominance of one-way risk communication practice. Second, Stern and Fineberg in *Understanding Risk: Information Decisions in a Democratic Society* (1996) highlight the need for societal dialogue coupled with research practice. Both publications highlight the importance of a turn to more collaborative approaches combining scientific analysis with stakeholder involvement. Even before that, seminal more fundamental reflections about changing the mode of traditional science and science communication practice provided the breeding ground, so fertile, that one wonders why so unheard, or perhaps better, so neglected in real practice. Two examples are Rosenhead's *Rational*

Table 10.1 Developmental stages in risk management

• All we have to do is get the numbers right
• All we have to do is tell them the numbers
• All we have to do is explain what we mean by the numbers
• All we have to do is show them they have accepted similar risks in the past
• All we have to do is show them that's a good deal for them
• All we have to do is treat them nice
• All we have to do is make them partners
• All of the above

Analysis for a Problematic World. Problem Structuring Methods for Complexity, Uncertainty and Conflict (1989) and *Uncertainty and Quality in Science for Policy* from Funtowicz and Ravetz (1990). Both publications contain pleas for new modes of balancing scientific uncertainty and societal challenges addressed by science, by opening up to more practice-relevant approaches and to practitioners and stakeholders. More recent examples in the field of environmental health echoing similar reflections and advice are Philippe Grandjean's *Non-Precautionary Aspects of Toxicology* (2005) and David Briggs' *A Framework for Integrated Environmental Health Impact Assessment of Systemic Risks* (2008).

These reflections share concerns and ambitions for better responses to the challenge of dealing with limited and ambiguous knowledge about societal important issues; in other words, of dealing with complexity. Whereas more traditional approaches such as the Santa Fé school (Kauffmann 1995; Holland 1998) merely believe that new scientific strategies in the face of complexity in the end will bring us closer to the modern scientific aim of ever more perfect knowledge and control, the critical complexity school (Cilliers 1998; Morin 2008; Kunneman 2010; Keune 2012) points out that limits of knowledge are inherent to complexity. The critical complexity thus points at the need for reduction of complexity, as we cannot fully embrace complexity. And it underlines the need for critical reflection on the normative basis for any simplification: why do we choose to take some elements of complexity into account, and other not? Methodological choices related to complexity cannot be objectified: they are open for discussion and for value laden preferences. This also has consequences for policy interpretation and policy action. Framing complexity is crucial: the complexity to be taken into account and the approach for dealing with that complexity is part of context specific negotiation amongst actors involved in the process of investigation and interpretation, and as such becomes negotiated complexity (Keune et al. 2013). This also poses the question who has the right to be involved in such negotiation? In principle all who have stake, such as the general public when it comes to important risk issues, can be considered for this. The core question of how to deal with limited knowledge on important societal issues in relation to environmental health is critical for risk communication.

We will next present some key aspects of two-way risk communication.

10.2.2 Who Communicate?

Risk communication is the act of conveying or transmitting information between parties about a range of areas including: levels of health or environmental risks; the significance or meaning of health or environmental risks; decisions, actions or policies aimed at managing or controlling health or environmental risks (Fewtrell and Bartram 2001). According to Bennett and Calman '*ongoing reciprocal communication among all interested parties is an integral part of the risk management process. Risk communication is more than the dissemination of information, and a major function is the process by which information and opinion essential to effective risk*

management is incorporated into the decision' (Bennett and Calman 1999). Thus, risk communication is an integral part of risk management.

Going back to earlier theories of communication (Laswell 1948), risk communication practice is often conceptualised as involving senders and receivers. There are a number of roles in risk communication that one might seek to incorporate according to Renn and Levine (1991). Some of these roles fit the senders of risk communication messages, other roles are applicable both for senders and receivers:

- Enlightenment role (aiming to improve risk understanding among target groups).
- Right-to-know (designed to disclose information about hazards to those who may be exposed).
- Attitude modification role (to legitimise risk-related decisions, to improve the acceptance of a specific risk source, or to challenge such decisions and reject specific risk sources).
- Legitimate function (to explain and justify risk management routines with a view to enhancing the trust in the competence and fairness of the management process).
- Risk reduction role (to enhance public protection through information about individual risk reduction measures).
- Risk reduction role (to enhance public protection through information about individual risk reduction measures).
- Behavioural change role (to encourage protective behaviour or supportive actions towards the communicating agency).
- Emergency readiness role (to provide guidelines or behavioural advice for emergency situations).
- Public involvement role (aiming at educating decision-makers about public concerns and perceptions).
- Participation role (to assist in reconciling conflicts about risk related controversies).

The general public is considered in most cases of risk communication the main target 'receiver' group. The involvement of the general public as stakeholder is needed to establish effective risk communication. However, beyond public commitments to increase public participation there is often little knowledge on how to engage with various "publics" (Löfstedt et al. 2011; Arvai and Rivers 2014). Communication should be perceived as a two directions process of providing information using different tools, understanding the reception of the information, reading the feedback and adjusting the information accordingly. Effective risk communication should be less about persuasion than about achieving fewer but better disagreements (Fischhoff 2013). In the eyes of the sender, the understanding of the reception of information has often to do with risk perception and acceptance. It is assumed

that acceptance of risks is greater when Fischhoff's (1995) eight developmental stages in risk management are met. As a precondition for engaging with stakeholders in a partnership, evidence needs to be communicated in a correct and intelligible manner, the ultimate health effect needs to be seen as not too big and the risk needs to be perceived as recognizable/manageable for all stakeholders, and finally the benefits need to be perceived as bigger than the risks.

The message sent has to be understood and the reciprocal exchange of information is fundamental to establish clear communication. The idea of the 'general public' as a target audience is generally misleading as there are many different groups of stakeholders, many 'publics'. Most stakeholders must be identified according to their position to the topic at hand.

Stakeholders are any individuals, groups of people, institutions (government or non-government) organisations or companies that may have a relationship with the project/program or other intervention at stake. They may—directly or indirectly, positively or negatively—affect or be affected by the process and/or the outcomes. Usually, different sub-groups have to be considered because within a certain group interests may be different (adapted from EU Project Cycle Management Manual 2004). In some projects or risk communication frameworks the following types of stakeholders are considered:

1. Those who are *important* to engage during a project or problem because they are important and/or influential in relation to the identified activities, e.g. environmental health managers and authorities, research institutes ("**developers and scientists**");
2. Those who are *influential* during and after a project, incident or programme, e.g. regional or local authorities (whether only advisory or with decision taking power) and other institutes influencing the public environment or health management or environment or health protection at local and/or downstream level ("**decision makers**");
3. Those who should apply or could be *instrumental in spreading the outcomes* or results (problematic, complex findings of research or planning scenarios, location specific management solutions, generic guidelines), e.g. public health authorities, national authorities dealing with public (environmental) health, existing local platforms/forums, NGOs, traditional authorities, patient organisations, etc. ("**end users**").

This approach, however, is increasingly challenging especially when it comes to the new roles of NGOs, the public and other interest groups. Since the 1990s regulators, especially in Europe, have experienced public distrust following large-scale incidents—from the BSE scandal in the UK to the dioxin in chickens

scandal in Belgium. As a result government has been under increased pressure to open up decision-making, which in practice means that influential stakeholders are increasingly able to influence risk communication (Löfstedt et al. 2011). On a global level, Sand (2003) has identified three main legal obligations to disclose information—and as a result, incentives to communicate:

- Disclosure to governments by environmental impact assessment statements;
- Disclosure to citizens under the ‘right-to know’ schemes;
- Disclosure to consumers through a variety of labelling schemes;

Therefore, increasingly, risk communication is seen as an integral part of the wider attempt to develop new forms of collective decision-making between regulators, industry, non-governmental organisations and the general public (Bouder and Löfstedt 2013). According to Renn, ‘effective communications must address, in as much detail as possible, the particular concerns of affected or interested parties in the specific case at hand (Renn 2008). In a majority of projects, incidents or cases there will be multiple stakeholder groups involved. In the case of power lines there are the inhabitants of houses under a high voltage line, but also the owners of the buildings in case of rental houses, the employees in case of companies, the local authorities and health services for the protection of public health, the power companies, maintenance staff and multiple other stakeholders. The risk communication to all of these stakeholders could have a different approach. These stakeholders will have different positions on the topic. The differences in interest will influence the risk perception and the way the communication will be conducted.

The senders of information in the process of risk communication are usually professionals linked to the authorities. Those authorities that are responsible for the health of the general public are usually the main stakeholders who convey messages related to incidents which might cause effects or alarm with the general public. There is a common misunderstanding that authorities have to possess all the available knowledge before communicating evidence or known facts. There is no societal obligation that authorities have to know everything. At the same time the authorities are not responsible for everything. However, they usually have the greatest influence over matters.

10.2.3 Essential Elements of Risk Communication

There are a range of elements identified in risk communication and in risk perception. In 2009 Frederic Bouder (2009) developed for the UK Risk and Regulation Advisory Council a science-informed “‘survivors’ guide” to help the institutional senders of risk messages cope with the risk communication challenge. The so-called “five As” of public risk communication suggest to consider five elements:

1. Assembling the evidence
2. Acknowledgement of public perspectives
3. Analysis of options
4. Authority in charge
5. Interacting with the audience

10.2.3.1 Assembling the Evidence

The first step for message senders is to “assemble the evidence” about a given risk. Concretely, this means that risk communicators need to demonstrate that they understand the science behind the risk and that their decisions will be based on credible evidence. This does not mean that a thorough risk assessment can always be conducted, but this means that basing decisions on mere judgment or discarding important new information when it does not fit with pre-established conceptions is unlikely to fare well with stakeholders.

10.2.3.2 Acknowledgment of Public Perspectives

Studying people’s perceptions and paying proper attentions to people’s concerns is also essential. The perception of risks differs from individual to individual, yet these variations are not irrational or random. Forty years or so of risk perception studies has uncovered a number of perception drivers, such as degree of control, catastrophic potential, familiarity, impact on children and fertility etc (Fischhoff et al. 1978; Slovic 1987): see Table 10.2. Personal experience is also important. If people do not believe they are in danger, for instance, or do not understand that they are at risk they are less likely to be receptive to risk communication information. On the other hand, people that have personally experienced the impact of crises or similar events will be much more receptive to risk advisories and communication than those who did not share this experience (Fitzpatrick-Lewis et al. 2010).

10.2.3.3 Analysis of Options

Consider a broad range of options and the associated trade-offs. Based on the evidence that you have assembled and public perspectives on the risk, you need to develop and analyse a broad range of options. Each option for managing the public risk that you consider will have costs and benefits, and these will often be different for different groups. You will need to understand, and explain, the trade-offs that need to be made in choosing particular options. You will need to show that your decisions are fair and justifiable.

Table 10.2 Risk perception (adapted from Fischhoff et al. 1978; Slovic 1987; Corvello 1998)

Factor	Increase public concern	Decrease public concern
Catastrophic potential	Fatalities and injuries grouped in time and space	Fatalities and injuries scattered and random
Controllability (personal)	Uncontrollable	Controllable
Manifestation of effects	Delayed effects	Immediate effects
Effects on children	Children specifically at risk	Children not specifically at risk
Familiarity	Unfamiliar	Familiar
Media attention	Much media attention	Little media attention
Origin	Caused by human actions or failures	Caused by 'Acts of God'
Reversibility	Effects irreversible	Effects reversible
Trust in institutions	Lack of trust in responsible institutions	Trust in responsible institutions
Uncertainty	Risks unknown	Risks known
Understanding	Mechanisms or processes not understood	Mechanisms and processes understood
Voluntariness of exposure	Involuntary	Voluntary

The methods used to analyse the options will depend on the context. Where appropriate, and where time allows, technical methods such as risk-benefit, cost-benefit analyses or multi-criteria decision analysis may help in reconciling trade-offs, including conflicting objectives and goals in different groups. Such analyses may be a part of a formal impact assessment. These technical methods can be supplemented by, for example, consultative, or deliberative, techniques. Optimum technical solutions are not necessarily perceived as the best solutions by the public and specific groups of risk actors, who will bring societal and special interests to bear on the solution. The technical and societal interests will need to be reconciled if the solution is to be generally accepted.

10.2.3.4 Authority in Charge

Define the nature of your involvement with the risk. There are several ingredients of open risk communication. These ingredients for open communication have been described in a report of RIVM (2013) on communication on environmental incidents:

1. Recognition or giving meaning to the message
2. Limitation of the damage
3. Providing information

The media focus often on the information and the way authorities are controlling or not the damage that has occurred. However, it is very important that the responsible person for the authorities or any other organisation that is providing risk communication, show that they take the situation very seriously, offer recognition and compassion for any victim. The messenger has the personal role to be a connecting factor to the affected population so it feels itself well listened to.

10.2.3.5 Interaction with the Audience

A common approach to obtain success in risk communication is to know that the message has been convincing the receiving stakeholders and that they feel that their opinion has been heard and taken into account. People's attitudes in this respect are influenced by a variety of factors and experiences. One factor is heuristics (Tversky and Kahneman 1974), i.e. mental shortcuts. For instance people may use heuristics to compare a new situation to a more familiar one. Talking about familiar situation will reinforced known conceptions that people can relate to. Affect (Finucane et al. 2000) and risk-as-feeling (Loewenstein et al. 2001) are other key factors that have been uncovered. Risk communication is not just about rationally exposing facts but about also about understanding and addressing people's affective motivations, including dealing with fears and sensitivities. We can distinguish three elements:

1. The ratio: the message should be understandable from the point of view of the receiving stakeholder, while it is also clear that this is the latest state-of-the-art knowledge of science.
2. The emotion: the receiving stakeholder should have a good feeling about the message. This has to do with believing in the messenger and believing in the message.
3. The ethics: The question has to be answered if the issue at hand is allowable to society, that it has to do with reliable common practice or that there is moral justice in what the message conveys. This latter issue is influenced by the moral attitude of people based on someone's societal position, culture or political ideas.

Under the Aarhus Convention (UNECE 1998), and through numerous 'right to know-initiatives' at local and national level information about risks has become more transparent. Examples include the many 'in my backyard' websites that now offer ready access to environmental information. Another somewhat unusual example, because of its focus on health effects (cancer risk) of pollutants, is the

‘right to know-website’ in the Netherlands (Ragas et al. 2006). This includes a public forum, where opinions on the release of such information to the broader public have been aired.

Chess et al. (1988) argue for citizen involvement in risk communication:

- people are entitled to make decisions about issues that directly affect their lives;
- input from the community can help the agency make better decisions;
- involvement in the process leads to greater understanding of—and more appropriate reaction to—a particular risk;
- those who are affected by a problem bring different variables to the problem-solving equation; and
- cooperation increases credibility.

The use of focus group may be considered in situations with stakeholders that have low influence but high interest. The focus group can serve the purpose of collective information about a specific subject or area of concern. It is a useful method to gather information on risk perceptions. Focus groups are also used to assess needs, preferences and attitudes of different stakeholders. The collected information can be used to formulate risk messages, to determine the appropriate channel of communication, to choose the best communicator and to frame the risk information in an acceptable way. The advantages of a focus group are multiple. This form allows participants to discuss a subject openly and in detail. The setup and conducting focus groups can be done quickly in a couple of weeks. This can be followed by quick implementation. This form is far less intimidating or frustrating than other forms of risk communication. The anxiety of the individuals is lessened in the group context.

10.2.4 Practical Recommendations for Risk Communication

We end this section with a practical overview of recommendations for risk communication in general (Covello 2003; Fagerlin et al. 2011; Verroen et al. 2013; modified):

- Accept and involve stakeholders as legitimate partner as early as possible in the process
- Listen to people and their peers, build trust
- Be honest, transparent, open
- Coordinate and collaborate with other credible sources

(continued)

(continued)

- Meet the needs of the media
- Communicate clearly by using a language that the stakeholders understand
- Plan thoroughly and carefully
- Enhance levels of efficacy beliefs in the message
- Present data using absolute risks and using frequencies
- Recognize that comparative risk information is persuasive and not just informative
- Be aware that the order in which risks and benefits are presented can affect risk perception
- Experienced communicator with empathy, trustworthiness, good speaker, eye contact, identification with audience

10.3 Two-Way Risk Communication Advisory Practice: How to Deal with Amateurism?

After this theoretical guided tour to risk communication, we will now turn to practice. We mainly focus on practice regarding collaborative approaches advising experts in the direction of more problem solving and two-way risk communication. We draw on our own experiences, in EU and national environmental health projects, sketching efforts and highlighting challenges that after decades are still prominent.

10.3.1 Analytical Deliberative Work in Belgium on Human Biomonitoring

Between 2001 and 2011 in Flanders (the Dutch speaking part of Belgium) human bio-monitoring research was being carried out, investigating the relation between environmental pollution and human health by measuring pollutants and health effects in human beings, using biomarkers. The project was carried out in the scope of the Flemish Centre of Expertise for Environment and Health (CEH), funded and steered by the Flemish government. In the CEH, environmental health experts from all Flemish universities and from two research institutes cooperate. The CEH combines natural (Schoeters et al. 2012) and social scientific research (Keune et al. 2014).

In two decision support case studies a multi-criteria group decision support method was applied. First the action-plan (2005–2007): together with medical and environmental scientific experts and policymakers, an action-plan for setting policy priorities with regard to the bio-monitoring results was developed (Keune et al. 2009).

Second the hotspot selection procedure (2007–2008): in the CEH we experimented with the input of a diversity of actors with regard to setting research priorities (Keune et al. 2010). Both approaches were inspired by the analytical deliberative approach (Stern and Fineberg 1996), an approach that combines scientific complexity and social complexity by linking expert analysis and debate with social deliberation. In practice it concerned close interdisciplinary cooperation: the general approach had to be negotiated between totally different disciplinary backgrounds and natural and social scientific data were combined. It also concerned close transdisciplinary cooperation with policy representatives: the research had to be policy relevant, which puts totally different demands on research than just scientific ones. Furthermore, both external experts and stakeholders were involved.

How did we get there? The general analytical deliberative approach resulted from a long and intense transdisciplinary dialogue in which social scientists gradually were able to bring this perspective into the discussion and into practice. The process of policy interpretation of the data was initially seen as an essentially scientific one; a working group was established, comprising mainly of environmental and medical experts both from science and policy. With the right group of experts, it was assumed, interpretation with regard to policy priorities would follow automatically. Once attempts were made to translate the scientific conclusions into policy priorities, however, it became evident that none of the environmental or medical experts involved dared to claim the necessary and overarching knowledge needed to prioritize. This was especially clear when incorporating other aspects considered relevant from a policy perspective, such as economics, social preferences or political feasibility. This resulted in openness to an analytical deliberative approach in which expert elicitation was combined with stakeholder consultation as a basis for advice for both the government (Keune et al. 2009) and the CEH (Keune et al. 2010). The ambition of the transdisciplinary team became one of open arms, embracing a broad diversity of actors and factors. Moreover the ambition stretched the horizon of scientific research to concrete policy action plans.

An essential element of the development towards an analytical deliberative way of working was a strategic approach. An important strategic move in the conceptual design phase that proved to be of decisive importance was an active listening approach: the use of an internal reflective questionnaire. At first the practical relevance of an analytical deliberative way of working was not recognized by the colleagues from natural science and policymaking. However, when in an in-group questionnaire questions were asked such as who are relevant actors and factors, elements of an analytical deliberative approach came to the fore. This led to a breakthrough in the conceptual development process and formed the basis for an approach in which questions of openness to relevant actors and factors were pragmatically dealt with.

So far, so good. Trying to bring ambitions into practice however created new dynamics causing a boomerang effect. Application in practice created pressure on the work of the colleagues: e.g. time pressure, pressure on their role as experts, practical pressure by complicating their own or the joint effort. As such the initial

enthusiasm of natural scientists and policy makers was overshadowed by concern for practical and analytical constraints. Without the social scientists being concretely involved, the analytical deliberative elements probably would have had a hard time to survive in real practice. It is therefore crucial that the analytical deliberative perspective is represented by ambassadors of such approach at the methodological decision table.

By joining conceptual discussions on policy interpretation of scientific research outcomes and reflecting on the ambitions of both natural scientists and policy representatives step by step from an active listening approach the role of the social scientist evolved to one of more central importance. One of the senior natural scientists involved, saying she (on the level of ambition) approved of the social scientific contribution, but she sometimes felt like an object of some social scientific experiment. Colleagues with natural scientific background sometimes react as if they feel lured into unexpected complexity, unknown to their expertise, difficult to handle and sometimes confrontational, and they either question its usefulness or appear to be unable to articulate the benefits themselves. This is also reflected in the often heard concern of the natural scientists and their counterparts in policy making that the analytical deliberative approach is relevant and interesting but should not stand in the way of the research or policy agenda and should not complicate the already complicated research and policy endeavour.

As part of the analytical deliberative approach, all external actors contributing to the project were asked for their feedback on the project. The vast majority evaluated openness to outsider perspectives and diversity of actors to be worthwhile. This is of course a bonus for those organizing such processes and for the end-user of the outcomes (e.g. policymakers). Simultaneously this can be perceived both as a stimulus and a pressure for prolonging such openness.

10.3.2 A Problem Solving Turn in Environmental Health Expert Elicitation in HENVINET

As mentioned in paragraph 2, the question of how to deal with limited knowledge on important societal issues in relation to environmental health is critical for risk communication. It is not always possible to prove unambiguously that a causal relationship exists between environmental pollution and specific health effects. Scientific assessment of environmental health risks is faced with large (partly irreducible) uncertainties, knowledge gaps, and imperfect understanding, out of which may arise deep-seated conflicts and controversies. The EU HENVINET project (Bartonova et al. 2012) had the ambition to synthesize scientific information available on a number of topics of high relevance to policy makers in environment and health: brominated flame retardants, phthalates, the impacts of climate change on asthma and other respiratory disorders, the influence of environment health stressors on cancer induction, the pesticide CPF and nano particles. At first it was the

ambition to focus mainly on the state of the art scientific knowledge, with a special interest in gaps of knowledge. By means of expert elicitation the gaps of knowledge were highlighted by using confidence levels for assessment of current scientific knowledge.

During the work in progress a complementary focus developed through interdisciplinary reflections (Keune et al. 2012): after long and intense discussions more traditional scientists opened up to the idea that the challenge of gaining knowledge about complexity is as important as the challenge to act based on limited knowledge. This resulted in extending the horizon from a mere scientific to the problem solving policy perspective: interpreting the synthesized available knowledge from a policy perspective, addressing the question which kind of policy action experts consider to be justifiable based on the identified state of scientific knowledge. As such the expert elicitation approach became helpful in overcoming the policy action impasse caused by the search for perfect scientific evidence. It did so by constructively discussing the weight of existing knowledge for potential policy action, thus stressing more the societal importance of the issues under study and considering to take action, rather than aiming for ever more scientific knowledge. Both parts of the expert elicitation, the assessment of state of the art scientific knowledge by means of confidence levels and the problem solving interpretation by means of a qualitative questionnaire and a workshop discussion, were quite challenging for all experts involved, as it did not relate easily to mainstream environment and health scientific practice.

The problem solving turn from mainly focusing on overcoming gaps in science to overcoming gaps between science and policymaking was strategically triggered by pointing at ambitions. The social scientist involved in the project while trying to introduce a problem solving perspective, realized it was not easy to convince the principal coordinator of the case study. The potential benefits of a problem solving approach were countered by pointing out practical complexities that would put further pressure on what in itself was already quite a challenging pioneering endeavour, let alone put pressure on the loyalty to the expert elicitation project of the natural scientists in the team. The social scientist used reference to ambitions that were part of the initial project aims, be it mainly dormant, and ambitions from the professional background of the principal coordinator of the project as persuasive arguments. He pointed out the initial ambition of policy relevance of the project as an argument for integrating a problem solving perspective. Also he referred to two grand old men in the field of environment and health for whom he knew the coordinator had high respect, and who promote a problem solving turn in the field of environment and health: Grandjean (2005) and Briggs (2008). Being part of the project one of them in fact had criticized the absence of a clear problem solving perspective in the early phases of the project. The fact that idealistic ambitions are often not easily applied in practice thus does not withhold them from being used as persuasive arguments: from a dormant or Ten Commandments' status to becoming seeds of practical change and inspiration. This case also exemplifies how an outsider perspective can be helpful: the social scientist joined the project at a later stage, thus as a newcomer could reflect on the work in progress from some distance.

How did the scientists perceive the experiment? In general most experts were positive, and sometimes very positive about the approach. A main negative critique to the approach seems to be that it is not sophisticated enough with respect to complexity, especially regarding technical issues and as such, according to several experts, it is too superficial for what is commonly understood as proper risk assessment. A challenge was that experts were expected to be an expert in all aspects of issue relevant complexity, when in fact they were not, or at least did not always feel at ease with this. The following statement illustrates this position:

Cannot agree that this is a group of experts, we were selected as guinea pigs, but not as a risk assessment group. You must make a distinction on how far you can go. I do not feel comfortable in serving policy makers conclusions.

Still, not all experts responded in the same way. Some were more self-confident in being able to give policy advice, and in fact in the end the majority of experts felt confident enough to be acknowledged in the policy briefs that were the output of the project. Even the expert being quoted above, after intense consultation on the content of the policy brief, changed position from not wanting to be acknowledged to wanting to be acknowledged.

One expert questioned whether such approach will indeed come up with new knowledge. Also to some experts lack of clarity about the process and their role was a problem. Positive critique is pointed to the fact that it was an innovative approach that was considered interesting and promising. In particular the opportunity to widen one's own horizon and to interactively exchange knowledge and debate with a diversity of experts seemed to be well appreciated in this approach. Different parts of the approach also helped in focusing on specific relevant aspects of scientific knowledge, and as such can be considered of reflective value. Moreover the combination of experts offered the opportunity to learn from and discuss diversity of interpretation from different perspectives. Diversity of expertise is considered important because of the complexity of the combination of relevant aspects, but is difficult to oversee for individual specialists. Also it was considered important to organize a good balance between different fields of expertise. Transparency about the background of experts is a related issue: it should be clear e.g. if experts have a relation with industry. More in general does any composition of expert panels run the risk of bias because of over- or underrepresentation of specific types of expertise. With respect to the involvement of experts it was suggested to recruit a large panel so as to ensure that enough will remain even when some drop out.

In comparison with risk assessment some stated this approach to be of complementary benefit: "Reports after risk assessments often take long time to write and may not reflect the latest data. We should not put this group aside. This is an intermediate stage. You will get different answers depending on who you ask; public, scientists, risk assessors." One expert even considered the approach better than risk

assessment as it seems to be more up to date on scientific information than most risk assessment documents.

When asked about the possibility of a stakeholder workshop, most experts welcomed the idea, even though (to some) certain aspects were unclear. E.g. the question who would be relevant stakeholders was unclear: policymakers and risk assessors were mentioned by one expert, industry by another. One expert pointed out that a balance of views is important. One expert was explicitly negative, stating this will probably lead to ‘prestige-filled confrontations’, thus questioning the relevance.

10.3.3 Role-Play and Social Learning in HENVINET

HENVINET conducted a role-play session at one of the project annual meetings (Van den Hazel et al. 2012). The role-play aimed to strike a balance between respect for the complexity of environment and health issues which the role play aims to discover and discuss, and the feasibility of the participants being able to fulfil their roles in the role play without too much difficulty, while simultaneously being able to facilitate social learning. In order to make the role-play easier to perform but also sufficiently illustrative of the complexity of reality, the discussion agenda was narrowed to one simple question. At the same time the diversity of actor roles involved in the discussion aimed to create the potential for the discussion to mirror the complexity of environment and health. As such the complexity of the situation was hidden behind the different social perspectives on what could be viewed, at first sight, as a simple issue. The participants had to play roles, in small groups of 2–4 persons, representing stakeholders from different organisations such as national authorities, scientific organisations (as consultants), industry, public health authorities and NGO’s. On the agenda of the role-play was a discussion on the meaning of a policy brief on the environment and health risks of a pollutant: the role-play discussion by a diversity of actors aimed to provide the authorities with advice on measures to be taken regarding the pollutant, based on the expert advice in the policy brief. This followed in the slip stream of the previously described expert elicitation case study which was also part of HENVINET (Keune et al. 2012). In that case study the step to stakeholder involvement was a bridge too far for extending the horizon in an analytical deliberative spirit. The role-play tried to address this challenge in a safe (experimental) and non-demanding (in terms of resources such as time) setting.

The aim of the role-play was on the one hand to test how a stakeholder discussion on such a policy brief evolved, and on the other hand to introduce stakeholder involvement to the participating experts. It thus aimed to perform a learning experience in different respects. Two moderators introduced the topic and the structure of the role-play. The roles were distributed among the participants of the session. These roles were randomly distributed. The roles were allocated to five different groups: local government, local residents, industry, non-governmental organisations, and public health authorities. The diversity in roles aimed to ensure that the complexity of the issues under discussion would be highlighted by the different perspectives and

stakeholders. The moderators provided role-information at the start of the session. Most participants could use their own experience and knowledge to fit their role. In this session the participants learnt from each other the lessons that emerged, and how each group supported its own arguments. The subgroups easily adopted the stereotype role of the stakeholder they represented. Industry was defensive, NGOs greatly opposing industry views, experts requesting more research, and local authorities waiting for a decision. In the evaluation it was stated that the views of different social perspectives were most valuable. The scientists performing the role of the NGO discovered how simple it was to use their own scientific knowledge to attack the polluter, the industrial representative. While the national authority representatives found it hard not to allow their scientific knowledge to prevail over the other issues they had to address including economic and social issues. The public health authorities were easily manoeuvred into the position of defending the general public's interest and health, although internally they had difficulties in agreeing the level of scientific proof. As a result they became less interesting partners for both the national authorities and the NGO's. Finally, the industrial representatives became defensive and deployed all available arguments concerning lack of scientific certainty to avoid any responsibility or claims of harm done.

The role play session illustrated the usefulness of stakeholder involvement in procedures that aim to provide policy advice based on scientific expertise. The social complexity of environment and health issues was clearly illustrated during the role play, indicating the added value for policy makers to be informed not only about scientific aspects of environment and health issues, but also about social aspects from a diversity of actor perspectives. The role play moreover was able to convince most of the participating experts of the usefulness of stakeholder involvement. One of the more sceptical experts in the end became one of the main defenders, and as a spokesman for the group vigorously presented the benefits both of the role play and stakeholder involvement to the non-participating experts from HENVINET. Moreover some participating experts indicated that the use of a method like the role play would have been beneficial to their perception of their involvement in the HENVINET project development, as it gave them the opportunity to better express their opinion in an interactive and cooperative manner.

10.4 Conclusions: Unmasking Zorro?

Where are we with risk communication development, after decades of analysis and advice pointing in the direction of a need for more problem solving and two-way risk communication (Par. 2)? One main conclusion is that the tendency for use of one-directional risk communication still is dominant. Another conclusion is that a large part of the effort regarding risk communication is still on collection of ever more detailed and stronger evidence of information about the (potential) problems, the risks at stake, and far lesser effort going to a solution focus knowledge effort and

far less effort going to collaborative analytical deliberative approaches. Does this mean that risk experts are doing a bad job with bad intentions? Or are they mainly like scientific Zorros: trying to do good, but not very transparent or open to dialogue and collaboration? Let us assume the latter and reflect to some lessons learned from collaborative practical efforts where risk communication experts tried to find a more modern approach together with these scientific Zorros (Par. 3).

Creating knowledge as such is another challenge than creating societally relevant knowledge and is another ambition than developing problem solving actions. Part of the answer is in the discussion amongst those who are in the driving seat: the cocktail of actors involved will create specific dynamics affecting the process. Professional contexts differ in professional tradition. Obvious examples are differences between quantitative and qualitative scientific approaches, between a focus on knowledge and a focus on action, between natural sciences and social sciences, between science and policy. The teams cooperating in several of the presented cases had to undertake a lot of negotiation during the process, the importance of which is often underestimated both in terms of impact on the process and its output, but also in practical complexity. The richness of dialogue can be very beneficial to a broader and more integrated view on complexity, but it is not always easy. The mind-sets of actors from specific contexts remain largely influenced by and focussed on their home-base contexts, and only to a lesser extent to the new collaborative context. This is beneficial from the point of view of specific expertise, and this is needed. But it can become problematic in the perception of other expert contexts: one is full of one's own expertise and related complexity, and has only limited sight of the complexity of other expertise, and in fact often underestimates this. This to a large extent cannot be avoided, as experts are often overloaded and are constantly attracted to context specific interests, rewards, challenges. This also means that the openness towards other forms of expertise is limited, as they only have limited attention for it and only limited interest. The transferability of expertise from one context to the other is possible of course, but will be more difficult once experts' contexts differ more. This poses the question whether we should invest in transfer of context specific expert knowledge to other expert contexts, or that we should focus on cooperation in well balanced inter- and transdisciplinary teams. From our experience it can be concluded that teamwork currently is absolutely necessary. Even after years of intense cooperation, natural scientific colleagues often still do not have clear sight of the complexity social science deals with. This would make a plea for constant and direct involvement of social scientists and in fact to the notion of the old saying: 'Let the cobbler stick to his last'. This also holds true for transdisciplinary cooperation between scientists and policy makers.

The *epistemological divide* between the traditional and alternative approaches largely sticks to ambassadors safeguarding either approach. Without ambassadors of either paradigm at the table where crucial methodological choices are being made, especially in practice and under resource constraints such as time pressure, the dominant approach will largely steer the process. This does not mean that there can be no cross boundary figures. This also does not mean that for example the traditional experts are not open to alternative approaches or that they do not see the

value of it. In the example of the CEH clearly there was good will regarding opening up, especially at the level of ambition, before concrete practical methodological choices had to be made. Still, along the way, the open arms appeared to be accompanied by closed mindsets amongst the traditional experts. Without the social scientists being concretely involved, the shift to a more collaborative approach probably would have had a hard time to survive in real practice. It is therefore crucial that the diversity which is considered to be relevant in the process in one way or the other is represented by either ambassadors of diversity as such or representatives of specific (e.g. experts and stakeholder) diversity at the methodological decision table.

Science should no longer hide behind expertism, elitist attitudes and non-transparent scientific black box approaches. Despite good intentions of environmental health experts to help society tackle risks, unmasking these scientific Zorros is crucial to take practice and its practitioners and stakeholders serious. It is time therefor for real professional risk communication experts to be involved in order to apply involved in two-way directional and problem solving collaborations.

References

- Arvai J, Rivers L (eds) (2014) *Effective risk communication*. Routledge, Oxon and New York
- Bartonova A, Koppe JG, Fucic A, Gutleb AC, van den Hazel P, Keune H (2012) The health and environment network and its achievements. *Environ Health* 11(Suppl 1):S1
- Bennett P, Calman K (eds) (1999) *Risk communication and public health*. Oxford University Press, Oxford
- Bouder F (2009) *A practical guide to public risk communication. The five essentials of good practice*. Risk and Regulation Advisory Council, UK
- Bouder F, Löfstedt R (eds) (2013) *Risk, critical concepts in the social sciences*. Routledge, Oxon and New York
- Briggs DJ (2008) A framework for integrated environmental health impact assessment of systemic risks. *Environ Health* 7:61
- Chess C, Hance BJ, Sandman PM (1988) *Improving dialogue with communities: a short guide to government risk communication*. New Jersey Department of Environmental Protection, Trenton, NJ
- Cilliers P (1998) Complexity and postmodernism. *Understanding complex systems*. Routledge, London
- Corvello VT (1998) Risk communication. In: Callow P (ed) *Handbook of environmental risk assessment and management*. Blackwell, Oxford, pp 520–541
- Covello VT (2003) Best practice in public health risk and crisis communication. *J Health Commun* 8:5–8
- Davies SR (2008) Constructing communication: talking to scientists about talking to the public. *Sci Commun* 29:413–434
- EU (2004) *Aid delivery methods - project cycle management guidelines Vol 1*, Brussels
- Fagerlin A, Zikmund-Fisher BJ, Ubel PA (2011) Helping patients decide: ten steps to better risk communication. *J Natl Cancer Inst* 103:1436–1443
- Fewtrell F, Bartram J (eds) (2001) *Water quality: guidelines, standards and health*. IWA, London. ISBN: 1 900222 28 0
- Finucane ML, Alhakami A, Slovic P, Johnson S (2000) The affect heuristic in judgment of risk and benefit. *J Behav Decis Mak* 1–6
- Fischhoff B (1995) Risk perception and communication unplugged: twenty years of process. *Risk Anal* 15(2):137–145

- Fischhoff B (2013) The sciences of science communication. *Proc Natl Acad Sci U S A* 110(Suppl 3):14033–14039
- Fischhoff B, Slovic P, Lichtenstein S, Read S, Combs B (1978) How safe is safe enough, a psychometric study of attitudes towards technological risks and benefits. *Policy Sci* 9:127–152
- Fitzpatrick-Lewis D, Yost J, Ciliska D, Krishnaratne S (2010) Communication about environmental health risks: a systematic review. *Environ Health* 9:67–82
- Frewer L (2004) The public and effective risk communication. *Toxicol Lett* 149(1-3):391–397
- Funtowicz SO, Ravetz JR (1990) Uncertainty and quality in science for policy. Kluwer, Dordrecht
- Grandjean P (2005) Non-precautionary aspects of toxicology. *Toxicol Appl Pharmacol* 207(Suppl 2):652–657
- Holland JH (1998) Emergence: from chaos to order. Basic Books, New York
- Kauffman S (1995) At home in the universe. Oxford University Press, Oxford
- Keune H (2012) Critical complexity in environmental health practice: simplify and complexify. *Environ Health* 11:S19
- Keune H, Bert M, Johan S, Ilse L, Gudrun K, Ann C, van Campenhout K et al (2009) Policy interpretation of human biomonitoring research results in Belgium: priorities and complexity, politics and science. *Environ Pol Gov* 19(2):115–129
- Keune H et al (2010) Open the research agenda: participatory selection of hot spots for human biomonitoring research in Belgium. *Environ Health* 9:33
- Keune H et al (2012) We're only in it for the knowledge? A problem solving turn in environment and health expert elicitation. *Environ Health* 11:S3
- Keune H, Springael J, De Keyser W (2013) Negotiated complexity: framing multi-criteria decision support in environmental health practice. *Am J Oper Res* 3(1A):153–166
- Keune H, Koppen G, Morrens B, Colles A, Springael J, Loots I, Teughels C, Chovanova H, Van Campenhout K (2014) Extended peer evaluation of an analytical deliberative decision support procedure in environmental health practice. *Eur J Risk Regul* 1:25–35
- Kuneman H (2010) Ethical complexity. In: Cilliers P, Allen R (eds) Complexity, difference and identity. Springer, Dordrecht
- Laswell HD (1948) The structure and function of communication in society. In: Bryson L (ed) The communication of ideas: a series of addresses. Cooper Square, New York, pp 32–35
- Leiss W (1996) Three phases in the evolution of risk communication practice. In: Kunreuther H, Slovic P (eds) Challenges in risk assessment and risk management. Special Issue of the Annually of the American Academy of Political and Social Science, vol 545, pp 84–95
- Loewenstein G, Weber EU, Hsee CK, Welch N (2001) Risk as feelings. *Psychol Bull* 127(2):267–286
- Löfstedt R, Boudier F, Wardman JK, Chakraborty S (2011) The changing nature of regulation and communication of risk in Europe. *J Risk Res* 14(4):404–429
- McComas KA (2006) Defining moments in risk communication research: 1996–2005. *J Health Commun* 11(1):75–91
- Morin E (2008) On complexity. Perfect Paperbacks, New York
- Ragas A, Huijbregts M, van Kaathoven E, Wolsink J, Wemmenhove J (2006) Development and implementation of a right-to-know web site that presents estimated cancer risks for air emissions of large industrial facilities. *Integr Environ Assess Manag* 2(4):365–374
- Renn O (2008) Risk governance: coping with uncertainty in a complex world. Earthscan, London
- Renn O, Levine D (1991) Credibility and trust in risk communication. In: Kasperson RE, Stallen PJM (eds) Communicating risks to the public. Kluwer, Dordrecht, pp 175–214
- RIVM (2013) Communicatie over milieu-incidenten. RIVM Bilthoven, The Netherlands
- Rosenhead J (ed) (1989) Rational analysis for a problematic world. Problem structuring methods for complexity, uncertainty and conflict. Wiley, West Sussex
- Sand PH (2003) Information disclosure as an instrument of environmental governance. *Heidelberg J Int Law* 63:487–502
- Schoeters G, Den Hond E, Colles A, Loots I, Morrens B, Keune H, Bruckers L, Nawrot T, Sioen I, De Coster S, Van Larebeke N, Nelen V, Van de Mierop E, Vrijens J, Croes K, Goeyens K, Baeyens W (2012) Concept of the Flemish human biomonitoring programme. *Int J Hyg Environ Health* 215(2012):102–108

- Slovic P (1987) Perception of risk. *Science* 236:280–285
- Slovic P (2001) The risk game. *J Hazard Mater* 86:17–24
- Stern PC, Fineberg HV (eds) (1996) *Understanding risk: information decisions in a democratic society*. National Research Council, National Academy Press, Washington, DC
- Tversky A, Kahneman D (1974) Judgment under uncertainty. *Heuristics Biases Sci* 185:1124–1131
- UNECE (1998) *Convention on access to information, public participation in decision-making and access to justice in environmental matters*
- Van den Hazel P, Keune H, Randall S, Yang A, Ludlow D, Bartonova A (2012) The challenge of social networking in the field of environment and health. *Environ Health* 11(Suppl 1):S15, <http://www.ehjournal.net/content/11/S1/S15>
- Van Kleef E, Houghton JR, Krystallis A, Pfenning U, Rowe G, Van Dijk H, Van der Lans I, Frewer LJ (2007) Consumer evaluations of food risk management quality in Europe. *Risk Anal* 27(6):1565–1580
- Verroen S, Gutteling JM, De Vries PW (2013) Enhancing self-protective behavior: efficacy beliefs and peer feedback in risk communication. *Risk Anal* 33:1252–1264
- Wynne B (1996) Misunderstood Misunderstandings: social identities and public uptake of science. In: Irwin A, Wynne B (eds) *Misunderstanding Science? The public reconstruction of science and technology*. University Press, Cambridge, pp 19–46