Content of Chapter 4

Roles of Environmental Experts in Practice

Chapter 4

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INTRODUCTION

This chapter discusses in detail the different roles that experts play at the interface between science, policy and society as they contribute to the solutions of environmental problems. The nature of this interface has been introduced in previous chapters. Chapter 2 has demonstrated that the idea that an expert 'simply' delivers knowledge to solve problems is an oversimplification. The everyday practice of decision making and knowledge production is characterized by a continuous process of drawing, redrawing, blurring and crossing the boundaries between science and non-science and between science and decision making. Chapter 3 has made it clear that experts operate within a specific institutional context that influences what they can contribute and what roles they can play.

This chapter focuses on the individual experts and demonstrates the different options these experts have and the different roles they can play in order to help solve environmental problems. Experts can only be effective if they are able to make conscious choices from this spectrum of options, and continuously reflect on the possible implications. As explained in chapters 2 and 3, experts have to recognize that not all types of environmental problems and all institutional decision-making settings require the same kinds of knowledge and strategies for knowledge production and boundary work. Moreover, as explained in chapter 1, the exact nature of an environmental problem is not pre-defined. What an environmental problem is all about and what the possible alternatives and solutions are is at least partly determined by the knowledge that is available and by the institutions and organizations involved. It is not self-evident that all parties involved will automatically agree on the nature of the problem, its causes and the preferred course of action. The way a problem is perceived affects what an expert can do. No matter what environmental problem an expert is asked to contribute to, neither knowledge production nor knowledge utilization is self-evident. This chapter offers some guidance on ways of dealing with this.

Section 1 introduces the choices an environmental expert has to consider. Section 2 then explores the different roles that experts can assume in particular environmental problem-solving practices. Section 3 describes the different dilemmas that come with choosing and playing different roles in practice.

LEARNING GOALS

After reading this chapter and completing the assignments in the e-workbook you will be able to

- describe and recognize the roles that you as an environmental expert can consider in a particular decision-making process
- critically reflect on your own expert role, taking into account your expertise regarding the problem at hand, the room for manoeuvre that the institutions and practices offer you and your personal and professional values.

1 Acting as an expert

Not every environmental expert working at the boundaries between science, policy and society works for a scientific research institute or a university, as explained in chapter 3. Experts are involved in both public and private decision making on environmental issues in academia and elsewhere: in consultancy (Alvesson & Johansson, 2002; Clark & Fincham, 2002), in knowledge-oriented and research institutes (Guston, 2001; Huitema & Turnhout, 2009), in policy and politics (Grijzen, 2010; Jasanoff, 1990, 2003), in companies, in NGOs, in advisory committees (Bijker, 2009), in audit teams (Power, 1997) etc. Both the policy context and the organizations they work for contribute to the institutional setting in which experts have to perform. What these different experts share is that they are all 'professionals' involved in supplying knowledge about environmental problems to the decision-making process (Abbott, 1988; MacDonald, 1995; Van der Arend, 2007). The users of expertise can be found in an equally wide variety of organizations: political and administrative bodies, participatory panels, private industry, consultants, NGOs etc. It is important for both users and producers of environmental expertise to realize what kinds of knowledge and experts are needed to effectively discuss and decide upon a particular environmental problem.

What does it mean to be an environmental expert?

Institutional setting

Knowledge and skills

Professional attitude and integrity

Wherever the personal pronouns 'his' and 'him' are used in this chapter, please read 'his or her' and 'he or she'.

What does it *mean* to be an environmental expert? Confronted with this question, an expert will consider the *institutional setting* and the corresponding requirements for knowledge, he will think about the *knowledge and skills* he has to offer, and he will take his *professional attitude and integrity* into account. The particular knowledge and expertise an expert has to offer have to fit in with the characteristics of the environmental problem at stake. The lessons learnt from chapters 1 and 2 will help you to become aware of the environmental problem you have to deal with. Self-assessment and reflection on daily practices, knowledge and professional ethics are core qualities of effective and professional experts (Argyris, 1991;Schön, 1983; Yanow & Tsoukas, 2009). An important aspect of this is an assessment of the situations in which the expertise will be used and the ways in which decisions will be made. After having studied chapters 1-3 thoroughly, you should be able to assess the institutional setting you are working in, identify the way(s) in which the problem is defined and perceived, and consider the types of knowledge that you can offer and the boundary work strategies you can use.

Imagine that you have been hired as a consultant, and are asked to design a solution for a particular problem and come up with clear-cut advice. In such a situation, you will probably not restrict yourself to offering a list of different options to address the problem. By contrast, if you are an employee of a research institute or a planning bureau, this is far more likely to be considered an effective strategy. Indeed, giving clear-cut advice on what should be done might be considered highly inappropriate and intrusive. As an expert, you have to be aware of these *formal and informal rules of the game* and operate within them.

Formal and informal rules of the game

Personal values and beliefs

In addition to assessing the situation you are in, it is also important to consider your *personal values and beliefs* and your professional ethics regarding what you consider to be just, morally correct and legitimate (Argyris, 1991; Broekhans et al., 2011; P. Healey, 2008; Jamison, 2010; Jamison & Maarleveld, 2001; Yanow & Tsoukas, 2009). The degree and extent of your engagement and involvement is also a matter of personal choices and preferences. Do you want to be an analyst, a strategic advisor, an expert consultant, an advocate, a sparring partner or a hands-on problem solver? At least to some extent, it is up to the individual expert to make these *choices*. This might involve working efficiently within the dominant frameworks and accepting existing power relations, but it might also involve producing counter-expertise to support minority views or positions.

Experts can make choices

Possible roles of an expert

This chapter offers you guidance in positioning yourself, assessing the situation you are in, and thinking about *possible roles* you as an expert can play. It includes reflection on the three issues discussed above:

1 *What types of expertise do I have on the subject, and how do they fit in with the problem at hand?* The effective use of environmental expertise and knowledge to decide upon and solve environmental problems assumes a match between particular knowledge(s) and the problem at stake. Previous chapters and debates in recent decades have highlighted that all knowledge developed for use in environmental decision making is shaped at least to some extent by the purposes of its practical uses (Healy 2008, Jasanoff 2003).

2 *What room for manoeuvre do the institutions and practices I work in offer?* It is not self-evident that institutions facilitate the use of knowledge in decision-making processes. Moreover, every expert would agree that knowledge is not always ready for use; it is only knowable and available through those organizations and practices that use it implicitly or explicitly (Concilio, 2010). Thus, efforts are required to improve the links between knowledge, decision making and the institutions that can effectively achieve this (Cash et al., 2006) (Healey & Hennessey, 1994; Nelkin, 1979).

3 *How do my personal and professional values feed into my possible contribution and role as an expert?* Processes of knowledge production, knowledge use and decision making need to be fair. Moreover, when experts contribute to or get involved in strategic decision-making processes, they should be aware not only of what knowledge they mobilize but also of the power relations that come with it (Healy, 2008). In the end, individual experts start from their own personal and professional values about what is good knowledge and how to act.

Patterns in the way experts act

Your answers to these questions will influence the way you act and what you do in a particular situation. Although this may seem very context-dependent and personal, certain *patterns* can be distinguished. Reflecting and deciding on these three issues involves assuming a particular role. The next section discusses a typology of five different roles of experts.

2 Roles of experts in context

Five schematic roles of experts

This section discusses *five schematic roles of experts*: the pure scientist, the arbiter, the advocate, the broker and the participatory expert. In principle, each of these roles can contribute effectively to environmental problem solving, but this depends on the three issues discussed in the previous section: the available expertise and skills, the room for manoeuvre offered by the institutional setting and the rules of the game, and the expert's own professional values.

Much of the literature about the roles and contributions of scientists in public policy (Huitema & Turnhout, 2009; Jasanoff, 1990; Ozawa, 1996; Pielke, 2007) is based on an individualist perspective, in which experts are assumed to be able to freely act and make choices. At the same time this literature recognizes that the institutional and organizational contexts in which experts operate structure and shape their choices, actions and decisions. In this line, this chapter emphasizes the importance of experts reflecting on and taking responsibility for their actions and the consequences of these actions, while recognizing that the *scope for action can be limited* in practice.

Scope for action for experts can be limited in practice

The choices to be made and the roles to be assumed revolve around two basic issues.

Intensity of engagement

The first refers to the extent and *intensity of your engagement* in the issue at stake and with the decision-making processes involved. Do you want to keep a certain distance by serving as a source of knowledge or by offering an evaluation of the various options, or do you want to immerse yourself in the process by offering a hands-on contribution?

Problem definition and perception

The second issue refers to the assessment of the way in which the *problem* is *defined* and *perceived*. As chapters 2 and 3 have demonstrated, this includes an assessment of the following aspects:

— What are considered to be the causes of the problem, what are the ideas on the way it should be solved, who is considered to be responsible and what values and interests are at stake?

— What characterizes the institutional context, what are the formal and informal rules of the game, what kinds of relations between knowledge producers and users are accepted, what is the level of risks and uncertainties involved and what knowledge is relevant, available or lacking?

Depending on the outcomes of these two issues, experts can assume different roles. Various authors have come up with different typologies of the roles of experts, types of knowledge production and the use and functions of knowledge and expertise (Hisschemöller et al., 2001; Leeuwis, 2004; Hoppe, 2005; Turnhout et al., 2007; Pielke, 2007). In this course we build on Pielke's (2007) typology as it focuses on individual experts. Pielke (2007) identifies four roles of experts. Three of these fit in with the linear view of the relation between science and decision

1) Pure scientists

2) Arbiter

3) Advocate

4) Broker

5) Participatory expert

making which has been discussed in chapter 2: (1) the *pure scientist*, who only delivers knowledge and steers clear of policy, plans, measures etc., (2) the *arbiter*, who makes sure that sound knowledge is supplied and corrects errors, misinterpretations and misuses of knowledge, and (3) the *advocate*, who uses knowledge to argue for a preferred course of action. Pielke aims to go beyond this linear model — and invites environmental experts to do so as well — by introducing a fourth role, that of the (4) (honest) *broker*. Brokers attempt to open up decision-making processes by exploring multiple perspectives and alternatives and by integrating societal (i.e. stakeholders') concerns with available knowledge. Although they are concerned with the production of relevant knowledge that is embedded in the context in which it is to be applied (as is argued in chapter 2), the role of broker takes the primacy of scientific forms of expertise over other types of knowledge for granted and maintains a distinction between knowledge and action. In chapter 2 (section 6), we have introduced participatory knowledge production as a mode of knowledge production that blurs the distinction between knowledge and action and between scientific and lay knowledge. In a similar vein, we add a fifth role here, that of (5) the *participatory expert*.

The next sections describe these five schematic roles. The example in box 1 illustrates that it is not always self-evident which role can be adopted. Experts can use this typology to reflect on the role they might opt for in particular practices, based on the three issues introduced above: the expert's expertise regarding the problem at hand; the organizational and institutional setting ('practices'); and the expert's professional and personal values. In the next sections these issues are therefore related to each of the roles.

Box 1

The contributions of hydraulic engineers to Dutch flood management

In an informal conversation, a water manager recently complained that he found it so hard to level with hydraulic engineers about policy development and to make legitimate flood management decisions. According to the water manager, no matter how his organization tried to guarantee sound and informed decision making, the hydraulic engineers continued to express severe criticisms in public (Vrijling, 2008). For example, one hydraulic engineer was quoted in the newspapers as saying that he found it unacceptable that political decision making aimed to minimize flooding effects instead of preventing national disasters. From his perspective, the politicians should immediately start large-scale maintenance of dykes. Although the water manager said that the decision-making process had been carefully organized to guarantee high quality expert input, the hydraulic engineer's impression was of a slapdash — even undemocratic — decision-making process. This story demonstrates that policy makers find it hard to legitimate decisions and committed engineers don't feel comfortable with the way their knowledge and expertise is used. Where does this discontent stem from?
Although the existential need for flood management is undisputed in the Netherlands, the last fifteen years have seen dramatic changes in Dutch flood management. Relations between the engineers at Delft University of Technology and water managers used to be very close (Bijker, 1995; Saeijs et al., 2004). In recent decades, however, fewer and fewer water managers are themselves engineers. When 'recommending'

their ideas and designs, engineers now have to deal with competing interests and values and competing experts and knowledge claims. Since the 1990s, water managers and other interested parties have become involved in critical debates about the required level of flood security and possible solutions to achieve this (Wesselink, 2007). Nowadays 'water safety' is no longer a one-dimensional policy concept, but refers to three layers of flood management, viz. prevention of flooding; sustainable spatial planning and preparedness (V&W, 2008) — with incongruous scales, dynamics, standards, aims, authorities and responsibilities (Van der Most et al., 2010). Moreover, not only technical water goals but also other goals have gained importance (e.g. (Alvesson & Johansson, 2002; Disco, 2002) and multiple — interrelated — sectors of public policy and related expertise have become involved. These sectors have their own requirements, standards, rules and regulations, not only for 'safety' but also for cost efficiency, cost recovery, assessibility, sustainability etc., which experts have to meet — and possibly change — during the design and implementation of innovative flood defences. Moreover, the government's policy of outsourcing of expertise to private consultancy firms has increased the variety of experts and claims involved.
All these developments indicate the radically changed context the engineers find themselves in (Van den Brink, 2009; Van der Most et al., 2010). All of a sudden, they no longer have such close relations with the water managers and they have to compete with other experts. Operating in this new environment requires engineers to adapt, change their practices, assume new roles and use new strategies.

2.1 THE PURE SCIENTIST

An expert in the role of a pure scientist would answer a request for support from a politician or CEO as follows: '*I only deliver numbers, facts and figures about the state of the environment; the interpretation is up to you*'.

Expertise
This answer summarizes the expertise the pure scientist offers — facts, numbers and figures about the state of the environment — and refers to a specific view of the relation between science and decision making, in which the *expert deliver the facts* but does not interpret them. A pure scientist restricts himself to explaining the state of affairs with regard to the relevant science, and only delivers data. One way to do this is to consistently discuss certain environmental phenomena or processes rather than focus on a specific environmental problem or issue. The facts and data delivered still need strategic or political interpretation in order to connect to environmental problems and their possible solutions, but the pure scientist will refuse to be part of this. His contribution is substantive and, at least at first sight, does not seem normatively laden. The pure scientist is fully *reason-oriented* and prefers to ignore the fact that experts and expertise have decision-making powers (see chapter 3, section 2.1).

Experts deliver the facts

Reason-oriented

Practices
Pure scientists can be found in several types of practice. They typically work at centres of expertise like universities, where they engage in basic research and data collection (see chapter 3, section 2). But pure scientists can also be found in non-university based research institutes. The organizations in which these specialists work maintain an

Keeping distance
Science-driven

appropriate *distance* to the 'real' solution to environmental problems in society. Their work is *science-driven* rather than demand-driven and is often mono-disciplinary.

Well-structured problems

The results of their studies can be usefully applied in societal processes in the form of data, methods and models, to support the solution of problems that are perceived as *structured*. Pure scientists frame these problems as technical problems, which require technical solutions and do not involve conflicts about values, competing interests or knowledge claims (see chapter 1). Environmental issues that are predominantly defined as structured are often regulated; this is true, for example, for occupational health and safety, safety of chemical plants, noise pollution etc. Flood management also used to be one of them, and hydraulic engineers delivered probability figures, strength calculations etc. (see box 1).

Values

Autonomy of science

According to the linear model (introduced in chapter 2, section 3), the pure scientist believes that the *autonomy of science* offers the best guarantee for delivering societal benefits. Strict separations between science on the one hand and society and politics on the other are considered crucial to protect scientific authority. Any interference by societal processes is seen as an infringement of scientific independence and objectivity. Consequently, the pure scientist does not want to be involved in the use of knowledge, decision making or participatory processes. In his perspective, an environmental problem should be solved through rational decision making (Drucker, 2000, Allison, 1971), based on scientific analysis followed by a sequence of steps towards goal-oriented action. If interaction does take place during this process of decision making, it is in the form of one-way traffic, in the sense that the pure scientist presents results and findings to the potential users. The pure scientist will be most comfortable if his knowledge and information are seen as authoritative, and if the supply and demand of knowledge are guided by professional standards and clear procedures.

2.2 THE ARBITER

If an expert is asked for a contribution to solve a particular environmental problem in the role of an arbiter he would say: '*This is the best available knowledge to answer your questions*'.

Expertise

Experts deliver facts to specific questions

Inform, not advise

The arbiter intends to deliver the same kind of knowledge as the pure scientist. But compared with the pure scientist, the arbiter recognizes that decision makers may have *specific questions* that require expert information or judgement. Sometimes this will require direct interaction with problem owners in order to be informed about the questions they have. In addressing these questions, the arbiter will focus on those questions that can be answered in isolation by means of scientific research. The arbiter might be willing to offer expert judgements, but will adhere to objective standards and avoid explicitly normative points of view. The aim of the arbiter is to *inform, not to advise*. Arbiters typically communicate their expertise in the form of 'if-then' statements: '*If* this is the objective, *then* these are the possible options you can choose from, and these are their effects and contributions to achieving this objective'. This is their way to avoid giving advice. Thus, arbiters prefer reason-oriented decision making, but they do recognize that others might have different values and interests, and therefore different objectives. They might inform one or more of these parties that they consider reasonable and hence recognize as acceptable partners in the decision-making process.

Reason-oriented, with awareness of different objectives

Practices

Arbiters can be found in many different types of practices and organizations, including universities, centres of expertise, commercial research companies, assessment agencies, planning bureaus and research units at ministries, as outlined in chapter 3. Although their activities are primarily *science-driven* rather than demand-driven, they may hold different positions from the pure scientists, since arbiters have a different attitude towards problem owners.

Science-driven

Like pure scientists, arbiters have a preference for problems that can be predominantly defined as *structured*. But they may also contribute to problems that are perceived as *moderately structured*, provided that the knowledge and expertise they provide will be used in a rational and technical way, and that they can *refrain from active involvement in the debates* and contestations. When competing perspectives and values come to dominate the debate, arbiters will find it increasingly difficult to operate effectively.

Structured and moderately structured problems

Refrain from active involvement in debates

Values

The arbiter's values resonate well with the linear model. In contrast to the pure scientist, the arbiter does *engage* in the way knowledge is used, although to a limited extent. And the arbiter will not take a position, offer advice or discuss policy options. But he will try to make sure that he addresses societal and policy questions using the best available knowledge, prevent incorrect knowledge from entering, and correct the incorrect uses or interpretations of knowledge. Unlike the pure scientist, the arbiter takes an interest in the practices in which his knowledge and expertise are used. If considered necessary, he will not only inform knowledge users, but also offer a technical explanation and clarification.

Engagement, though to a limited extent

2.3 THE ADVOCATE

An expert in the role of an advocate will propose: '*Do you know that this solution is available for your problem?*' And he might add '*I have the expertise and if I had a say in this, I would know what to do*'.

Expertise

Compared to the previous two roles, the advocate does deliver solutions instead of 'just' knowledge, and is willing to interpret, evaluate and apply knowledge as he sees fit, to contribute to solving a particular environmental problem. The advocate adopts a *normative position* with regard to knowledge use and problem solving. Still working in the linear model (chapter 2, section 3), the advocate goes a step further than the arbiter and *translates scientific results and findings into statements and advice* about what should be done.

Normative position

Translates findings into advice

Nowadays, some hydraulic engineers promote their traditional specialist solutions by using arguments like 'it is important to ensure that homes do not get flooded, so we need to strengthen the dykes' (See box 2).

Box 2

Hydraulic engineers as advocates

Following the influential report by the second Dutch 'Delta Commission', the Ministry of the Environment and Infrastructure launched a new policy research programme to improve the overall Dutch water system. The programme interlinks with research programmes at various Dutch universities. One of the Delta Commission's recommendations is to achieve a so-called 'Closeable Open Rhine Delta': a system of open river mouths and estuaries, only to be closed in case of an extreme storm at sea or a major storm in combination with high river discharges. Hydraulic engineers from Delft University of Technology proceeded to design four new river flood barriers in addition to the existing storm surge barriers to protect the highly urbanized region of Rotterdam. In doing so, they interpreted the Commission's vision in a narrow way, focusing only on safety and ignoring issues of spatial quality that were also included in the vision, and offered a single solution to match this interpretation. This is an example of advocacy: the promotion of a single solution or a preferred course of action based on knowledge and expertise.

Advice geared to one preferred solution

Engagement

The step that advocates take from 'what is' to 'what ought to be (or be done)' can take different forms and does not necessarily lie beyond what is normally understood as science. But advocates implicitly or explicitly do take sides in the sense that the knowledge and advice they deliver is geared towards *one particular problem definition and preferred solution*. Advocates take responsibility for what is done with their knowledge and expertise by *engaging* in decision making. They realize that decisions will most likely be based on rational as well as political arguments, but they value a sound scientific basis for decisions.

Scientific arguments will be used strategically

This role can cope with different perceptions of environmental problems. Facing structured or moderately structured problems with consensus about relevant knowledge, advocacy may go unnoticed and be unproblematic as there is consensus about the nature of the problem, the different possibilities to solve it and the role of knowledge. However, advocacy is most visible if experts deal with problems that turn out during the decision-making processes to be characterized by deep-seated conflicts of values or interests which cannot be solved by pacification, such as the cockle fisheries controversy described in chapter 2. In such situations of controversy and contestation, *scientific arguments will be used strategically*, for example to promote the prohibition of certain activities by demonstrating their negative effects. These arguments will also be used to demonstrate flaws in the scientific knowledge used by the other party in the debate or to discredit people. Importantly, even if experts do not seek the role of advocate, they may not be able to avoid becoming involved in a controversy. Willingly or unwillingly, they become part of the debate and are pushed into the role of advocate when parties in the controversy use their knowledge in a strategic way to underpin their positions or undermine the other party.

Practices

Practices in which advocates traditionally operate are interest groups such as industry lobby organizations or environmental organizations. Advocacy is expected and accepted in lobbying practices. Moreover, the knowledge and expertise of these organizations is often a valued ingredient of negotiations and debates. However, advocates can also be found in all kinds of institutions and organizations as introduced in chapter 3, including universities, NGOs, corporations, policy-making bodies, advisory councils, businesses, consultants and so on. Regardless of the organizations involved, advocacy can be expected to emerge as soon as an issue becomes contested (see chapter 2, section 5). According to the linear model, advocacy is seen as *inappropriate* for scientists and experts. However, it is important to realize that actively seeking contestation or assuming a position of advocate may be a perfectly legitimate thing to do. It is especially when experts find themselves confronted with *unequal power relations and practices* of exclusion and oppression that this particular type of boundary work and its balance between reasoning and powering is often accepted by experts and decision makers. And it is important to recognize that working within these practices and power relations also involves taking sides and assuming a normative position, albeit in a much more implicit and hidden form, because the experts involved not only accept these practices but also reproduce and strengthen the power inequalities involved.

According to the linear model, advocacy is inappropriate for scientists and experts

Position of advocate may be legitimate in cases of unequal power relations

Values

Advocates *actively engage in particular interests*, values and/or norms. Civil servants and policy advisors have to agree with pre-defined principles and policy frameworks, consultants have to meet their clients' needs and have to comply with the terms of reference set for the project, and employees of NGOs have to agree with what the organization stands for, be it the promotion of business interests or the protection of the environment. These experts use their knowledge and authority to design possible interventions and strategies that contribute to the achievement of certain goals and interests.

Advocates actively engage in particular interests

2.4 THE BROKER

The mission of an expert who acts as a broker is to improve decision-making processes: '*Let's challenge the government to think about the different options and perspectives. I can contribute to this by offering the expertise required for dealing with the issues at stake in an open and responsible way*'.

Expertise

Like the advocate, the broker *actively engages* in decision-making processes, but aims to be less biased towards one specific problem definition or solution. The broker provides knowledge about the particular environmental problem at hand and its possible solutions, while *taking into account different perspectives and interests* of parties involved. Like the advocate, the broker is concerned with *linking knowledge to action and decision making*. But his mode of operation is markedly different. Rather than seeking scientific justification for certain positions, brokers attempt to *broaden the scope of possible problem definitions and solutions*. They aim to actively connect the demand and supply of knowledge and bring together all parties in the decision-making process. They want to facilitate open dialogue about a particular environmental problem by delivering knowledge and generating options and alternatives that fit in with the different views and perspectives of the parties involved. The assumption is that this is the best way to enable a complete and fair assessment.

Broker actively engages in decision-making processes

Taking into account different perspectives and interests

Linking knowledge to action and decision making

Broaden the scope of possible problem definitions and solutions

Practices
If the problems at hand are predominantly defined as structured, there is no recognized need for the activities of brokers. In problems that involve value conflicts and controversies, brokers will find it difficult to operate effectively because they are likely to be treated as advocates. In these cases, attempts to open up the range of possible perspectives and alternatives might not be the best approach, and experts may in fact serve society better by narrowing the range of options (Jasanoff, 2008). Brokers are most effective when differences in values and interests are openly recognized and have not (or not yet) resulted in heated and polarized controversies, and when uncertainties abound. In other words, in problems that are predominantly perceived *unstructured*.

Unstructured problems

Brokers often work in boundary organizations like planning bureaus, advisory councils and committees, consultancy firms etc. Not all organizations, institutions and regimes are open to their approach to problems, and they may prefer experts to keep more distance and assume the role of arbiter (see chapter 2, section 3). Although brokers are concerned with the production of relevant knowledge that is embedded in the context in which it is applied, they primarily focus on scientific forms of expertise and tend to neglect the role of non-scientific knowledge.

Values
In the role of a broker, the relation between knowledge production and use is not unidirectional but is a *two-way interaction* which involves intensive communication. The broker differs from the arbiter in his explicit engagement which goes beyond listening to policy questions and producing knowledge in isolation. The broker is vividly aware of the boundary work to be done, and aims to *contribute knowledge* about the *normative, practical, technical and political issues* that come with an environmental problem. Brokers generate science-based policy options by interacting closely with the potential users of their knowledge and try to deliver usable and relevant knowledge, while at the same time making sure that scientific validity is not compromised. This is a tricky *balancing* act between *reasoning* and *powering* which always involves the risk that their role is not accepted and that they are treated as advocates. This is either because the broker is seen as advocating the interests of the user (who pays, decides), or because the broker is seen as advocating his own interests (selectively brokering only knowledge that fits in with these interests).

Two-way interaction

Contributing knowledge about normative, practical, technical and political issues

Balancing between reasoning and powering

2.5 THE PARTICIPATORY EXPERT

The expert who opts for a role as participatory expert will offer an invitation: '*Together with you and others, we will look for solutions to complex environmental problems. Let us try and tackle these problems together*'.

Expertise
A participatory expert uses his own expertise to enter into *joint processes of knowledge production and use*. This expertise can take the shape of data, methods, ideas, concepts and arguments. The participatory expert moves away from traditional linear conceptions of the relation between the production of knowledge and its use in society and decision making.

Joint processes of knowledge production and use

As explained in chapter 2 (section 6), their mode of operation is post-normal or transdisciplinary. Two important aspects stand out: (1) not only scientists but also citizens and stakeholders are considered to be *producers of relevant and credible knowledge* and (2) *knowledge and action* are seen as *intertwined* in the context of a specific societal issue or problem. Thus, the processes in which the expert participates involve the simultaneous production of knowledge, problem definitions and solutions.

Various producers of relevant and credible knowledge

Knowledge and action intertwined in the context of a specific societal issue

Practices

Starting from a societal issue or problem

The participatory expert *starts* from a *societal issue or problem* and aims to simultaneously create and link knowledge supply and demand. In this sense, the participatory expert goes beyond the activities of brokers because he organizes and engages in participatory and interactive practices. The outcomes of these practices are not pre-defined, and are uncertain even to the participatory expert himself. Participating in these practices requires a broad spectrum of skills. It is not only about offering knowledge and communicating it in such a way that others can understand it; participatory experts need to be able to organize and facilitate processes of interaction and knowledge production, and they need to be able to cooperate with people with a wide variety of perspectives, ideas, interests and values.

Participatory air quality assessment in three UK cities

Box 3

An article by Yearley et al. (2003) provides an interesting example of the role of participatory experts. The article reports on processes of participatory air quality assessments in three UK cities. These processes were organized in response to negative sentiments among the public about the current air quality assessments based on computer models, and the way in which these assessments were used by the government to make decisions on managing air pollution. The authors of the article organized participatory processes in which community members produced spatial representations of air pollution based on their own knowledge, experiences and perspectives. In the second part of the participatory processes, these community maps were compared with the maps produced by the computer models used by the government. The value of lay knowledge was demonstrated when the community map was shown not only to be compatible with the computer-based map but also to complement it with important knowledge about local variations in air pollution. In this case, the authors of the article played a role as participatory experts. They used their expertise on the relation between science, computer models and citizens to facilitate productive interactions between citizens, government officials and air quality modellers which, instead of each party repeating their positions and aggravating the controversies, involved the integration and synthesis of different types of knowledge.
(Yearley et al., 2003)

Values

Valuing various forms of knowledge

Participatory experts *value both scientific forms of expertise and non-scientific knowledge*, and actively attempt to bring all kinds of experts together to jointly produce new knowledge, and new ideas about the environmental problem at hand and its possible solutions. To do so, they have to critically reflect on current regimes and institutions, and look for innovative ways to deal with them or change them.

Unstructured problems

This role is essential if problems are perceived as *unstructured*, if there are irreconcilable interests, values and perspectives and if there is no consensus about the definition of the problem, the possible directions and solutions and the knowledge required. The first step in these processes is to come to a joint definition of the problem. The next important aspect is that of processes of joint fact finding (DuPuis & Gareau, 2008). However, even problems that are considered to be more structured may benefit from the activities of a participatory expert who is able to increase the quality of knowledge and decisions by including stakeholders and their knowledge.

Participatory forms of knowledge production are very demanding

Until now, the participatory expert and the practices of knowledge production described above have not been very common. *Participatory forms of knowledge production are very demanding*. The participants need sufficient time to deliberate, they need to detach themselves from the institutions, rules and routines they are familiar with, and they need to develop new ones for their joint practice of knowledge production and problem solving. Nevertheless, there are some examples in the Netherlands of innovative projects and programmes that experiment with the co-production of knowledge for complex and contested environmental problems, in so-called Communities of Practice. For example, the knowledge development programme called 'Living with water' involved over 100 consortia of governments, businesses and centres of expertise closely cooperating to produce practical knowledge for current and future water management (www.levenmetwater.nl). A second example is Knowledge for Climate (www.kennisvoorklimaat.nl), a research programme that aims to develop knowledge and services enabling the Netherlands to become climate-proof. Governmental organizations and businesses actively participate in research programming and knowledge production. They produce knowledge that is needed to assess what investments need to be made in spatial planning and infrastructure over the coming twenty years to improve resilience and adaptive capacity.

2.6 CONCLUSION

We have outlined five schematic roles of experts contributing to the solution of environmental problems, in terms of the kind of expertise they offer and their views on the relation between knowledge production and the institutions and practices in which they can be found to operate. The five roles differ as regards the following two dimensions:

1 Distance or engagement: The question is whether experts want to keep their distance from decision making (pure scientist and arbiter) or actively engage in these processes by listening to user demands and by designing possible options or promoting certain courses of action (advocate, broker and participatory expert).

2 Taking a linear or an interactive view of the relation between knowledge production and use. The question is whether the experts believe that knowledge informs decisions (the pure scientist, the arbiter, the advocate) or adopt a more interactive perspective on the relation between knowledge production and use (the broker, the participatory expert). Although interaction implies that not only scientific knowledge but also lay knowledge and perspectives are taken into account, the participatory expert is most explicit about this. While the broker

primarily mediates between knowledge and action, the participatory expert comes close to collapsing the two by simultaneously generating knowledge and solutions in the context of interaction.

We have introduced these schematic roles for various reasons. First of all, each of these roles is related to specific situations or contexts that are recognizable in practice. Second, the roles are recognizable because each highlights certain aspects of working as an environmental expert in a societal and institutional context. Thus, the typology of roles as a whole shows that experts play different roles in different situations. It is important to remember the following points regarding this typology:

1 Experts can play a variety of roles and may make conscious choices about their role and position.
2 Roles are not equal to individuals. One individual can move between roles, even within one process, situation or case.
3 No role is intrinsically desirable or reprehensible, and each of these roles can be legitimate depending on the situation.

The roles are schematic types that *can be recognized* in practice but *do not exist* as such in their pure form. In real life, all situations, organizations, problems and individuals will show characteristics of two or more types of problems, ways of knowledge production and use, regimes and expert roles.

To be effective, experts have to continuously and critically reflect on their options and responsibilities, while at the same time recognizing that they are not fully in charge of the role that they play. Such reflection is important because in practice, experts face a variety of requests for knowledge, support, proposals and advice, which may also originate from different principals and from different institutions with different views about the contribution of experts to solving environmental problems. Depending on the dominant problem definition and the institutional setting in which experts operate, being effective implies different roles, practices and activities. Systematically addressing the three main questions posed above — what expertise on the subject do I have? in what context do I operate in terms of dominant problem definition and formal and informal rules of the game? what personal and professional values do I have to consider? — will help experts to make choices and reflect on them. As explained in chapters 2 and 3, the quality of the contributions made by experts should be evaluated in the social and institutional context in which the knowledge and expertise are produced and used.

3 Expert dilemmas

Each role comes with risks as well as opportunities

The need for experts to reflect on their role is all the greater because each role comes with *risks* as well as *opportunities*, and assuming a role unavoidably involves dilemmas. The three questions that experts should continuously reflect on cannot be answered unequivocally: the definition of the problem (or certain aspects of it) may vary widely, problems initially presented as structured can turn out to be highly contested or used as a front for another problem, many institutions and practices have to be assessed intuitively since the rules of game are often informal and unwritten, and tensions and conflicts between values can gradually become manifest or change. Three dilemmas are discussed below.

1) distance vs. engagement

One of the best-known dilemmas is that between *keeping a distance* (pure scientist, arbiter) and *engaging* (advocate, broker, participatory expert). Keeping a distance from societal and decision making processes will ensure that you as an expert are seen as scientific and impartial and not as an advocate. However, the risk is that your expertise will not be used or will be used incorrectly. Engaging in decision-making processes results in a higher likelihood of correct use of knowledge, but this is a risky strategy for experts because they may become disappointed by the way in which they and their knowledge are treated and they may lose their authority because they are seen as advocates.

2) becoming part of the process vs. only offering knowledge-based options

A second dilemma occurs once you become engaged in the process. The question is whether you want to *become part of the process* and solve the problem together with the other actors (as a participatory expert) or *only offer knowledge-based options or alternatives* (as a broker). The latter offers more opportunities to keep at a distance from the solution of the environmental problem than the former. However, joining the process as an equal participant rather than an expert offers opportunities for equalizing power relations and effective problem solving that the role of broker does not.

3) arguing for one specific option vs. presenting multiple perspectives and alternatives

Thirdly, it may be legitimate to opt for ending the debate by *arguing for one specific option* (as an advocate) rather than *presenting multiple perspectives and alternatives* (as a broker). For example, when experts are asked to design ready-to-use solutions for problems that are considered to be structured, it is often not useful to bring in new perspectives and a wide range of options. It can be perfectly legitimate to play the role of advocate by offering knowledge that fits in with a single problem definition and a particular preferred solution. This is the case particularly in technical or private (as opposed to public) matters, for example when consultants are hired by companies or other private organizations. In public issues, however, experts may want to open up the process based on considerations of legitimacy. And when certain voices or options are actively excluded or suppressed by dominant actors who are able to promote their own problem definition, it is important that experts are willing to resist the dominant frameworks and be critical, even if this means explicitly seeking the role of advocate.

Processes are dynamic

Apart from the dilemmas, it is also important to recognize that the processes involved are *dynamic*. Powerful actors may succeed in structuring the problem by actively pursuing a technical definition of the problem and ignoring or neutralizing other problem definitions. Subsequently, outsiders may successfully open up the process and get their problem definition included, thereby in effect unstructuring the problem. The expert who thought he could unproblematically work as a pure scientist by delivering knowledge or as an advocate by proposing a solution is now faced with a new situation and must reconsider his role. Also, value conflicts cannot endlessly be conciliated, and at a certain moment, a controversy may emerge because concrete decisions have to be made that affect actors' interests (as demonstrated in Turnhout et al., 2008, see chapter 2).

Given these dilemmas and dynamics, it is important to be flexible and reflective. The roles outlined in this chapter are not intended as fixed categories but aim to depict a spectrum or repertoire of possibilities without claiming that once a role is chosen one has to stick to it and apply it consistently. Roles do not refer to individuals in the sense that they define an expert's intrinsic identity. They are also not automatically linked to certain types of institutions in the sense that universities harbour only pure scientists, while boundary organizations harbour brokers. Experts may choose to alternate flexibly between roles or even develop their own mixtures. Dealing with environmental issues requires experts to interpret the situation they are in, to adapt to changing circumstances, to reflect on risks and opportunities and to reconsider their activities and strategies.

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