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A dialogue approach to enhance learning for sustainability—A Dutch experiment with two participatory methods in the field of climate change

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Abstract

This article addresses the involvement of stakeholders in sustainability research and suggests that stakeholder dialogues should be perceived as processes of learning and argumentation. Rather than urging the participants in a dialogue to seek a consensus on a specific solution strategy, the dialogue design should prevent certain issues and viewpoints from being (ex ante) excluded from the analysis by facilitating the exploration of different (conflicting) claims and arguments about the problem and about its possible solutions ('learning by argument'). The article reports on a Dutch stakeholder dialogue initiative in the field of climate change, and shares insights about the use of two particular methods that were used in this dialogue—interactive backcasting and repertory grid analysis—and the extent to which these methods encouraged the argumentative process. The use of two evaluative criteria, 'differentiation' and 'integration', made clear that interactive backcasting facilitated the argumentative process by providing a better understanding of the implementation pathways of a broad range of response options to climate change, while repertory grid analysis contributed to the integration of the backcasting results and the development of criteria for climate policy. Although both methods need to be improved for future applications, they seem to be promising methods to be used in future interactive sustainability research.

Keywords: stakeholder particpation, learning, backcasting, repertory grid

1 Environmental complexity and the need for stakeholder participation

Global environmental problems, such as climate change or loss of biodiversity, are often labeled as persistent, complex or unstructured. These kinds of prob-

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lems can be recognized by: their strong linkages to other problems; the multitude of elements that play a role and the fact that these are all interrelated; severe scientific uncertainties; competing knowledge claims; conflicts of interest; values in dispute; and social, organizational, political and technological constraints to solve these problems (Mason & Mitroff, 1981). In order to reduce the impact of human activities on global life support systems and to induce transitions towards a more sustainable future, the problems of global environmental change need to be dealt with urgently. This requires far-reaching approaches that focus on systems change, including production, distribution, consumption, and disposal activities. Such system change cannot be brought about by technological innovations alone but requires mutually reinforcing institutional and socio-cultural transformations (Vellinga, 2001). It has become increasingly recognized that solving the problems of global environmental change is not the job of governments alone, but is a joint challenge for science, policy and society worldwide. As a result, problem-solving processes explicitly require the involvement of actors from civil society, such as businesses, environmental and consumer NGOs and the public. These actors are also referred to as 'stakeholders'.

1.1 What is a stakeholder?

In simple wording, a 'stakeholder' is someone who has a stake in a certain issue or decision. In the literature, many different definitions of a stakeholder can be found (see Renn et al., 1993; Von Winterfeldt, 1992; Mason & Mitroff, 1981). These definitions differ from each other in some important ways. In some definitions, actors are only identified as stakeholders when they are organized in a group, whereas in other definitions, individuals can also be stakeholders. Furthermore, by some definitions, an actor needs to have a clear interest in order to be a stakeholder, whereas other definitions acknowledge that the stakes may sometimes be rather unclear. In order to better understand the meaning of the word stakeholder, I distinguish three stakeholder characteristics (see Van de Kerkhof, 2004). The first is that both individuals and socially-organized groups can be stakeholders in the decision-making process. The second characteristic is that, in the case of complex problems, it is not always clear what the stake(s) of each actor is (are). Different actors may have a different perception of their own and each other's stakes, and these stakes may change over time. The last characteristic is that the relevant group of stakeholders may vary. The number of stakeholders involved in the issue under consideration is not necessarily fixed but may change over time. As the decision-making process evolves, new stakeholders will enter the scene and others will leave.

In this article, the concept 'stakeholder' refers to actors from society and not to actors from government and the scientific community. This is an ideal-typical distinction as, particularly in the case of complex problems, it is not always clear what separates the scientists, the (governmental) policy makers, and the stakeholders. According to the constructivist approach to environmental science, the domains of science, policy, and society are intertwined and are sometimes even hard to distinguish (Jasanoff, 1990; Gieryn, 1995). Due to the inherent scientific uncertainties that characterize complex environmental problems, scientists can no longer be seen as neutral advisers who provide the policy process with hard facts and unambiguous information (Fischer, 2000). Therefore, stakeholder knowledge is considered to be of complementary value to scientific knowledge (Wynne, 1996), and scientists and policy makers are as much stakeholders as any other actor involved in the problem concerned; they all have their own agendas and interests in the problem and in the solutions to this problem.

1.2 Why stakeholder participation?

The academic literature on participation provides a number of justifications for stakeholder participation. First of all, participation may increase public awareness and acceptance of the problems that society faces and of the measures that need to be taken to solve these problems (Kickert et al., 1997). Secondly, participation may lead to better decisions as it enriches the decision-making process with relevant viewpoints, interests and information about the problem under consideration that could not have been generated otherwise. It helps to rule out overlooking something, which in turn may improve the decisions (Teisman, 1997, 2001). Thirdly, participation may increase the legitimacy of decision making, as it enables the stakeholders to engage in deliberation with policy makers and scientists about the decisions that need to be taken (Fischer, 2000). Fourthly, participation may increase the accountability of decision making, as participants get an inside view in the decision-making process and they become co-responsible for the decisions that are made and the actions that are taken (Van Kersbergen & van Waarden, 2004). Finally, participation may result in learning. Stakeholders, government and scientific experts enter into a dialogue and, by interaction and debate, they learn about the nature of the problem, about possible solutions to this problem, and they learn to deal with conflicting views and interests (Van de Kerkhof & Wieczorek, 2005).

1.3 Critical notions of participation

Although stakeholder participation can be valuable, it should not be considered a guarantee for successful problem solving. In the academic literature, several critical notions of participation can be found (see Van de Kerkhof, 2004). The first criticism comes from Schumpeter (1942), who argued that 'average' citizens are not capable of a rational judgment on complex matters that go beyond the experiences of their daily lives. Especially in matters that involve norms and values, such as politics and environmental problems, the policy preferences of citizens are merely manipulable opinions that change with the issues of the day. This implies that citizens will only be rational to a limited extent, even if their interests are at stake. A second criticism is that stakeholders tend to mainly defend their own short-term interests and to 'free ride' on collective goods (as is illustrated by the NIMBY Syndrome (Not In My Back Yard—see Rosa, 1998)). Furthermore, interaction between stakeholders tends to aggravate conflict and can even lead to a deadlock. A third criticism relates to the level of knowledge that stakeholders have; some argue that, in order to act meaningfully in a participatory process on matters of environmental complexity, stakeholders must have a reasonable level of scientific information (Webler, 1995). However, research on environmental attitudes shows that, among the many explanations of how people come to take a certain attitude towards an environmental issue, scientific knowledge turns out to be the least significant (Scholten & Midden, 1992). Another pessimistic view on the possibility of a reasonable level of scientific knowledge among the stakeholders is that they have a 'natural' tendency to mistrust scientific experts (Berk et al., 1999). A fourth criticism follows from the assumption that stakeholder involvement may override existing legitimate decision-making processes and undermine the position of parliament (Cooke & Kothari, 2001). Furthermore, participation may facilitate an illegitimate and unjust exercise of power as it can lead to decisions that reinforce the interests of the already powerful. This is also referred to as the 'participation paradox' (Seley, 1983; Berk et al., 1999), which means that, in order to participate effectively, one needs power resources that are not equally distributed over the affected population. Power resources include access to relevant information and possession of a 'voice' loud enough to get heard by the decision makers. Weaker interests are often in a marginal position, so participation initiatives will not be accessible to them. The last criticism that is mentioned here relates to the selection of participants. The number of potential stakeholders may be infinite, so if everyone were allowed to join the process, the debate will never end and decision making will become impossible. As a result, only a limited number of stakeholders can be involved, which raises questions about representativeness.

1.4 Objective and structure of the article

The critical notions mentioned above may, for some, be a categorical rejection of stakeholder participation. I would rather consider them factors that may prevent stakeholder participation from working and that, as a consequence, need careful attention in the design and implementation of a dialogue process. In this article, a dialogue process is understood as a process of learning in which scientists, policy makers, and (other) stakeholders jointly explore options for dealing with matters of environmental complexity.

I argue that, in order to establish a process of learning, the design of the dialogue should focus on facilitating a process of argumentation in which the participants generate insights into the multiple aspects of the specific problem, the different conceptions of the problem, and the assumptions that underlie these conceptions. So, rather than urging the participants in the dialogue to seek a consensus on a specific solution strategy, the dialogue process needs to facilitate the exploration of different (conflicting) claims and arguments about the problem and its possible solutions. Since the participants in a dialogue may be reluctant to openly disagree with one another, a process of argumentation needs active facilitation. In this article, I present two methods that can be used for this, and evaluate their use of in a Dutch stakeholder dialogue on climate change.

The structure of this article is as follows. In Section 2, a classification of degrees of participation is used to point out that proper participation should be understood as a process of mutual learning. Section 3 proceeds with the concept of learning and links it to the interactive exploration of conflicting claims and arguments. Section 4 presents two specific methods to encourage the deliberative process in a stakeholder dialogue, and explains how these methods have been used in a Dutch dialogue project in the field of climate change. Section 5 evaluates how successful these methods have been in the Dutch case, in terms of whether they encourage argumentation. Section 6 draws conclusions and presents a number of challenges for interactive sustainability research in the future.

2 Stakeholder participation as a matter of degree

Stakeholder participation is often equated with allowing societal actors to influence the outcome of plans and working processes. The 'ladder of participation' that was developed by Arnstein (1969) is a good example of this. This ladder has eight rungs, which reflect eight degrees of 'decision-making authority.' Arnstein aimed to reveal the critical difference between symbolic, ritual participation, and stakeholders having real power. From low to high decision-making authority, the eight degrees of participation according to this ladder are: 'manipulation'; 'therapy'; 'informing'; 'consultation'; 'placation'; 'partnership'; 'delegated power'; and 'stakeholder control.'

Although decision-making authority is important, meaningful stakeholder participation should not be narrowed down to matters of political power alone as a very powerful yet information-lacking group of citizens or stakeholders cannot do much with their authority. Participation should therefore also be related to issues like access to information, transparency, and the fairness of the process. This requires an alternative ladder of participation than the one Arnstein (1969) developed. In that connection, it is useful to borrow from Mayer (1997), who developed a typology of strategies of participatory policy analysis, which includes different stakeholder roles. Although Mayer does not use this framework to distinguish degrees of participation, it will be used for this purpose here. Ranging from low to high, a classification can be made of seven degrees of participation: 'information'; 'consultation'; 'anticipation'; 'mediation'; 'coordination'; 'co-production'; and 'mutual learning' (see Figure 1).

'Information' is the lowest degree of participation. Its primary function is to inform the stakeholders, to make them aware of scientific findings and policy plans and to explore the usability of information. The flow of relevant information is downwards, i.e., from the initiators to the stakeholders. This means that the stakeholders have the rather passive role of 'consuming' the information that is offered to them.

The following three degrees—'consultation', 'anticipation' and 'mediation'—are moderate degrees of participation. The stakeholders are asked to give an

Information	Consultation	Anticipation	Mediation	Co-ordination	Co-production	Mutual learning

Low degree of participation -------------------------------- High degree of participation

Figure 1: A classification of degrees of participation (based on Mayer, 1997).

input, but the initiators still determine the outcomes of the process. In 'consultation', the flow of relevant information is portrayed upwards, i.e., from the stakeholders to the initiators. 'Anticipation' enables the stakeholders to give their perspectives on the future, and to formulate possible strategies to create or anticipate this future. In 'mediation', the initiators want to learn what stakeholders know about their mutual values and interests, and what level of consensus or compromise can be reached.

'Coordination', 'co-production' and 'mutual learning' are the highest degrees of participation, in which the stakeholders in mutual interaction and deliberation determine the outcomes of the process. 'Coordination' enables stakeholders to coordinate (interdisciplinary) knowledge, objectives, and means in relation to a certain problem. In 'co-production' stakeholders create a basis for the formation of coalitions to jointly work on projects or develop new initiatives. 'Mutual learning' is the highest degree of participation. It enables the stakeholders to interactively explore new styles and strategies for policy making and it enhances a change in stakeholders' core knowledge and attitudes.

Processes of stakeholder participation can provide useful insights for problem solving including critical review of scientific information and evaluation of policy options in terms of feasibility and social acceptability. The dialogue should be understood as a process of learning in which the stakeholders have the opportunity to articulate their knowledge, values, and preferences about specific problems and policy options. In the next sections I will further explain how to understand 'learning' and in what ways it can be encouraged.

3 Learning by argument

Although I consider 'learning' a useful concept for improving the contribution of interactive processes to problem solving, at the same time, it is a rather ambiguous concept. In order to better understand the meaning of learning this section links the concept of learning to the need for a process of argumentation.

3.1 The meaning of learning

The concept 'learning' is used in various settings and for different purposes. Conventionally learning occurs when individuals assimilate new information, including that based on past experience, and apply it to their subsequent actions (Hall, 1993). In the academic literature, learning is used in many different ways including social learning (Hall, 1993), political learning (Heclo, 1974), government learning (Etheredge, 1981), organizational learning (Argyris & Schön, 1978) and policy-oriented learning (Sabatier, 1988; Sabatier & Jenkins-Smith, 1993). Although these conceptions of learning may differ from one another in various ways, they all imply a change: those who learn undergo a change in knowledge and/or in action; and they all encompass improvement: those who learn improve their knowledge and/or action (Van der Knaap, 1997). Learning thus has a positive connotation.

From the literature on organizational research, policy analysis, and innovation sciences two levels of learning emerge. The first level is characterized in the literature as: single-loop learning (Argyris & Schön, 1978), instrumental learning (Van de Graaf et al., 1996), or lower-order learning (Brown et al., 2003), and concerns new insights about policy options in the case of a given policy problem and a given policy context. The second level of learning is characterized in the literature as: double-loop learning (Argyris & Schön, 1978), political learning (Van de Graaf et al., 1996), or higher-order learning (Brown et al., 2003) and concerns new insights that relate not only to the solutions to a certain problem but also to the problem itself and to the context in which decisions take place.

These notions of learning mainly refer to policy learning and policy change. This implies the generation of new insights, leading to actual changes in one or more components of the policy-making process. In order to increase the usefulness of these notions of learning for stakeholder dialogue processes, I propose the concepts of first-order learning and second-order learning (see Van de Kerkhof, 2004). First-order learning refers to the cognitive level of analysis and relates to new insights into the 'facts' and the expectations of the involved actors concerning a certain policy issue, in a policy certain context. The factual status of the claims that are made is not the subject of the discussion. In first-order learning, the participants in a dialogue may for instance change their attitude towards a specific policy option or policy instrument.

Second-order learning, on the other hand, refers to the normative level of analysis and is based on the idea that facts and values cannot be separated. Second-order learning is achieved when the participants in the dialogue gain new insights into the complex relationship between causal and normative reasoning and, in terms of constructivism, manage to re-identify the social origins of (what were assumed to be) specific facts. In second-order learning, the participants may for instance change not only their attitude towards a specific policy option, but they may also change their core beliefs and assumptions regarding the very nature of the problem that is being addressed.

3.2 The relevance of argumentation

In the case of issues of environmental complexity, the participants in a dialogue are unlikely to increase their understanding of the problem if they are merely provided with new (factual) information. Understanding a problem not only requires factual and empirical knowledge, but also insight into the normative aspects that concern the deep core convictions and beliefs that shape people's observations of everyday reality. Providing the participants in the stakeholder dialogue with information—particularly scientific information about facts, trends, or developments—is not a remedy for the lack of understanding. Rather than clarifying the differences of view, information may even add to the confusion (Mason & Mitroff, 1981). Ignorance does not primarily follow from a lack of information on the 'facts', but from a lack of insight into the (conflicting) normative assumptions underlying the different viewpoints. The participants may not only be unaware of each other's assumptions, they may even be unaware of their own assumptions as well.

Therefore, in order to encourage second-order learning, the dialogue process should be designed as a process of argumentation. This fits in with the work of Habermas (1970) on 'the ideal speech situation' in which he proposes a process of deliberation in which the participants engage in an open process in which they exchange opinions and viewpoints, weigh and balance arguments, and offer reflections and associations (see also Webler, 1995). The importance of argumentation lies in the connection that exists between problem definition and problem solving, in that the actual construction of a problem already points to its perceived solution and, in that way, sets the alternatives for policy (Dunn, 1988). The problem under consideration can never be defined 'objectively' and the perception of a problem can change as new knowledge has becomes available. As a result, the definition of a problem is ultimately a matter of political choice. In order to improve problem solving, problem definition and solution finding should not be two separate stages in the policy process but instead should be connected (Hisschemöller & Hoppe, 2001). The focus on a process of argumentation will help to prevent relevant (stakeholder) information from being excluded from the analysis and, as a consequence, the dialogue process from generating a wrong (limited) perception of the problem.

How can these theoretical notions on second-order learning and argumentation be put into practice? What kind of tools and methods can be used for this? A comparison of a number of participatory methods has led to the conclusion that many participatory methods or tools are neither apt nor meant to facilitate the interactive articulation and exploration of conflicting lines of argument (Van de Kerkhof, 2004). Even if such approaches are built around a discourse that favors second-order learning through participation, deliberation, and argument, their practical application may fall short in fulfilling their discursive promise. The next section presents two specific participatory methods that can be used to facilitate the articulation and evaluation of conflicting claims and arguments, and evaluate the use of these methods in a recent Dutch experience in the field of climate change.

4 Two participatory methods for learning by argument

The two methods presented in this section both have the potential to facilitate an argumentative process. It concerns 'interactive backcasting' and 'repertory grid analysis.' Both methods were developed some decades ago and have been applied in a renewed way in the Dutch Climate OptiOns for the Long term (COOL) project: a stakeholder dialogue on strategies for long-term climate change policy in the Netherlands. This section introduces the COOL case and then explains how the methods of interactive backcasting and repertory grid analysis have been used in this case.

4.1 The COOL case

The COOL project aimed to develop strategic perspectives on how drastic reductions of GHG emissions in the Netherlands could be achieved in the long term, in a European and global context[1]. The project included a series of workshops in which stakeholders discussed the feasibility of drastic reductions of greenhouse gas (GHG) emissions in the long term; the opportunities and obstacles that have to be overcome in order to reach such reductions; and the challenges and priorities for the short term. The project included four stakeholder groups, representing four sectors: Industry and Energy; Agriculture and Nutrition; Housing and Construction; and Traffic and Transport. The four groups consisted of a heterogeneous group of stakeholders, including representatives from multinationals, small business companies, banks, unions, environmental NGOs, policy makers, et cetera. The identification and selection of these stakeholders had taken place on the basis of an extensive interview round that the project team had conducted in the preparation phase of the project with about a hundred stakeholders from different sectors of Dutch economy. This extensive interview round enabled the project team to identify stakeholders from different networks who had rather different views on the issues of climate change and energy, and on the 'best' solutions to these issues.

The project followed a 'what if' approach: What must happen if the emissions of GHGs are to be reduced drastically? The project team formulated the working hypothesis of a GHG emission reduction of 80 percent by 2050, compared with 1990 levels, in the Netherlands and Europe, and a related percentage for the global reductions. The choice of 80 percent was based on the ultimate goal of international climate policy to stabilize GHG concentrations in the atmosphere at such a level, and within such a time frame, that no dangerous interference with the climate system would occur which would threaten food supply, natural ecosystems and sustainable development. The participants in

[1] The COOL project lasted from January 1999 until May 2001 and was financed by the National Research Program on Global Air Pollution and Climate Change. The project included three dialogue projects, taking place at three different geographical levels: national (Dutch) (Hisschemöller et al., 2002*a*,*b*), European (Andersson et al., 2002) and global (Berk et al., 2001). This paper mainly reports on the experience of the National Dialogue.

the dialogue were not asked to address the issue of whether such an emission reduction would be desirable as a climate policy target. Rather, the dialogue took an 80 percent reduction of GHG emissions in the Netherlands as a working hypothesis. The willingness to explore this hypothesis was a prerequisite for the stakeholders to participate in the project. Subsequently, the participants explored ways to realize an 80 percent emission reduction and, at the end of the dialogue, they gave a reasoned judgment on whether, and how, this could be done.

4.2 Interactive backcasting

The idea of backcasting originates from the 1970s when Lovins (1976) used the 'backwards-looking-analysis' approach to explore long-term energy policy in the US. Later, Elmore (1980) developed the 'backward mapping' approach, and Robinson (1982), eventually, coined the term 'backcasting' as an alternative to traditional planning and forecasting methods.

4.2.1 Rationale

The rationale for backcasting is twofold (Robinson, 2003). First, our ability to predict the future is strongly constrained due to the fundamental uncertainty that exists about future events. Second, even if the future were predictable, in the cases of complex problems like sustainability, the most likely future may well not be the most desirable. In such a situation, it is important to explore the desirability and feasibility of alternative futures rather than focusing merely on their likelihood (Dreborg, 1996). This leads to an approach that is explicitly normative in its approach to the future. Backcasting claims to generate innovative results, as it does not look at the future from currently dominant trends but takes a future as a given and focuses on its realization (Dreborg, 1996).

Originally backcasting was an analytical tool for foresight research but, more recently, the approach has also been applied in an interactive setting in order to address complex and unstructured problems (see Robinson, 2003; Van de Kerkhof et al., 2002; Weaver et al., 2000; Vergragt, 2000). This can be referred to as 'interactive backcasting' which is defined as: "An exercise in which stakeholders choose one or several future images(s) as the starting point for the analysis and, subsequently working backwards to the present situation, explore which interventions are needed to realize this future. In this exploration, the stakeholders identify milestones to be passed, opportunities to be taken, and obstacles to be overcome along the way" (Van de Kerkhof et al., 2002, p. 86.).

Interactive backcasting assumes that the starting point lies in the distant future and that this move stimulates an open discussion remote from daily concerns. The backwards-analysis, in its turn, stimulates the participants to reflect and deliberate on the implications of the long-term perspective for short-term policy making, and on the assumptions on which specific policy choices and preferences are based.

Interactive backcasting can also be combined with a modeling approach, in which the participants proceed by making input decisions and then running the model forward through time to see what the outcome of those decisions would be in the future (Robinson, 2003; Carmichael et al., 2004). This form of backcasting is an iterative process in which the desired future image is a product of the process of trying to reach it. This means that the elements of the future images do not have to be known in advance. The participants may come to change their minds about what is desirable, based on seeing the outcomes of specific choices.

The backcasting characteristics of openness, reflection, and iteration particularly provide opportunities for learning and argumentation. The link between the long term and the short term stimulates the participants to argue for short-term actions and to investigate whether these short-term actions contribute to the realization of the long-term perspective. Also, interactive backcasting has the capacity to explore a variety of (desirable) futures and to identify 'robust options', i.e., options that look promising in more than one future image.

4.2.2 Exploring response options to climate change

Although the dominant idea of backcasting is to stimulate creativity and innovation (see, e.g., Dreborg, 1996), the use of the method in the COOL project was based on the belief that innovations, creative as they may be, needed to be evaluated in terms of their feasibility and public support. Interactive backcasting was used to explore the obstacles and opportunities that might occur in the implementation of specific (technological) response options to climate change.

Before the backcasting exercises took place, the four stakeholder groups developed two future images for their own sector of Dutch economy by the year 2050. These images differed in several respects but all assumed that, by the year 2050, the sector had reduced its GHG emissions by 80 percent compared with the 1990 level. During the backcasting exercises, sub-groups of 4 to 6 people analyzed a variety of response options to climate change. The time allocated for the analysis of a specific option was 1.5 to 2 hours.

The procedure was as follows. First, the participants selected a specific option to analyze with interactive backcasting. Second, they chose one of the two future images as the context of the analysis and formed a joint view on what the option under consideration looked like in this specific context. Third, the participants reasoned 'backwards' and discussed obstacles and opportunities that might occur in implementing the option. The question to be addressed was: "Suppose that, by the year 2050, option X is implemented to the extent that is assumed in the future image, what opportunities and obstacles have occurred 'along the way'?" Fourth, the participants defined what, according to them, was the most important problem that needs to be solved in order to implement the option. The idea behind this is that decision makers often have the habit of addressing the easiest problems first and only then move on to the more difficult ones[2]. Fifth, the participants found out how the most important problem can be solved over time, and decided what short-term actions are required for this. They also identified the actors that are relevant in this respect. Sixth, the participants mapped out the implementation of the option on a time path, which highlighted the major interventions related to obstacles and opportunities over time. As a last step, if necessary, the participants carried out a quick scan of the option in the context of the other future image. They addressed the question: "Suppose this option was implemented in the other future image, to what extent were obstacles, opportunities, the most challenging problem, and the interventions different from those revealed by the current analysis?"

The first two steps of the procedure encouraged the participants to be open and to set aside their short-term interests and concerns by placing the starting point for the discussion in the distant future. Steps 3 and 4 were assumed to connect the long term to the short term, and to encourage the participants to make an argued choice for the most important problem that needs to be solved. Step 5 was assumed to increase the argumentative process further; in this step, the participants were asked to reflect on the implications of the long term for short-term policy making, and on the roles of the involved actors.

4.3 Repertory grid analysis

Repertory grid analysis originates from the field of 'construct psychology' (Kelly, 1995), and, since then, has it found its home in the areas of artificial intelligence, education, and human learning. In the field of policy analysis, this method has also gradually gained ground (Van de Kerkhof, 2004; Dunn, 2001; Dunn & Ginsberg, 1986).

4.3.1 Rationale

The basic idea of repertory grid analysis is that the minds of people are 'construct systems', which reflect their constant efforts to make sense of the world (Kelly, 1995). These construct systems are highly individual in nature and guide people's behavior. People observe, draw conclusions about patterns of cause and effect, and behave according to those conclusions. People's construct systems are not static, but are confirmed or challenged every moment they are conscious. Moreover, construct systems are not always internally consistent. People can, and do, live with a degree of internal inconsistency within their construct system. Basically, repertory grid analysis aims to unfold categorizations by articulating individual construct systems. This helps to better understand what meaning people give to a certain problem situation, and to identify possible inconsistencies in their way of thinking.

[2] It must be noted that the postponement of difficult problems is not by definition a bad habit. Sometimes (e.g., in international peace negotiations), the most difficult questions are deliberately postponed in order to create a momentum for progress and, thereby, create a context in which the most difficult questions become resolvable.

Repertory grid analysis includes two concepts: 'elements' and 'constructs'. The 'elements' are the objects of people's thinking to which they relate their concepts or values. The 'constructs' are the qualities that people use to describe the elements in their personal, individual world. An essential characteristic of a construct is that it is *bipolar*. Repertory grid analysis relates the construct of an individual directly to the elements.

Repertory grid analysis is characterized by two claims. The first claim is that the method efficiently (with a limited number of interviews that take a limited amount of time) elicits the true range of relevant constructs in a particular context (Dunn, 2001). It takes 20 to 25 interviews of about one hour each in order to have a sound overview of the most relevant constructs (Van der Sluijs et al., 2001). The second claim is that repertory grid analysis is unusual compared with a number of other techniques, as the interviewer, due to his or her minimal role, does not heavily influence the respondents through questioning (Van der Sluijs et al., 2001). The only steering that may take place is if the interviewer selects the elements for the analysis.

4.3.2 Developing criteria for climate policy

After the backcasting exercises, the participants in the COOL project were asked to discuss criteria for long-term climate policy. In order to encourage the participants to use the insights from the backcasting exercises the project team searched for a method that would integrate the outcomes of the separate backcasting exercises, and link these to the discussion about policy criteria. The method that was chosen for this was repertory grid analysis.

The method was used in individual phone interviews with the participants, and the outcomes of the grid analysis were discussed with the participants in the next workshop. Basically, the participants were asked to compare the options that they had analyzed with interactive backcasting (e.g., biomass, solar photovoltaic, CO_2 sequestration and storage, wind energy). The backcasting options were the elements of the analysis, which implied that, compared with a regular repertory grid analysis, the use of this method in the COOL case was characterized by a minimal influence of the interviewer, as the elements for the analysis were not selected by the interviewer but by the participants.

The procedure of repertory grid analysis was as follows (see also Van de Kerkhof, 2004). First, the interviewer (i.e., the analyst) combined the backcasting options into triads of options. Second, the interviewer randomly selected three triads for each phone interview. Third, the respondent (i.e., the participant) was asked to compare the first triad of options. In this connection, he or she was posed the question: "In what respect do two of these options equal one another and differ from the third?" This resulted in one or more constructs that apparently steered the respondents' personal observations with regard to the problem. Fourth, the respondent specified what was the most important, and what was the least important, construct with regard to long-term climate policy. Fifth, the respondent ranked all the options according to the specific construct. Then, the previous three steps were repeated for the other two triads of options. After all the respondents were interviewed, the results of the entire group were analyzed and put into a matrix. This matrix included elements, constructs, and rankings. The participants used the matrix to translate the major constructs into criteria for climate policy.

Repertory grid analysis encouraged the argumentative process by connecting the outcomes of the separate backcasting exercises and integrating these into criteria for policy. Furthermore, the capacity of repertory grid to articulate participants' personal preferences for long-term climate policy, and to elicit possible inconsistencies and tensions between different viewpoints, was assumed to stimulate the participants to explore conflicting viewpoints as well as the assumptions underlying these viewpoints.

5 An evaluation of the methods on the basis of the COOL experience

In order to give an indication of the extent to which interactive backcasting and repertory grid analysis actually achieved second-order learning and encouraged the participants in the COOL project to explore conflicting claims and arguments, I use two evaluation criteria: 'differentiation' and 'integration.'[3] 'Differentiation' refers to the extent to which the participants in the COOL dialogue discussed both technical aspects and normative aspects of greenhouse gas emission reduction. 'Integration' refers to the extent to which the participants made argued choices and how they dealt with the interplay of facts, values and principles with regard to the topics that were discussed. In order to evaluate the degree of integration, it is helpful to use elements from Toulmin's ((1969), but see also Dunn, 1994) model of the structure of a policy argument. On the basis of this model, it is possible to evaluate lines of arguments, including claims (i.e., the conclusion of the argument), warrants (i.e., a justification for the claim, based on either empirical information or normative insights), backings (often lie at the root of the warrant and provide an additional reason to accept the claim), and rebuttals (i.e., a second conclusion that states the conditions under which the original claim is unacceptable of unfeasible). Using these elements allows for the elicitation and critical examination of the assumptions that underlie the claims that the participants make in the discussion.

The definitions of the criteria 'differentiation' and 'integration' make clear that in the COOL project 'learning' was related to different discursive levels: on the one hand, there is a discussion about facts and expectations (first-order learning); on the other hand, values, principles and emotions play a role too (second-order learning).

[3] These criteria are borrowed from Hoogerwerf (1990) who developed a set of criteria to evaluate a policy theory. These criteria are: (1) precision of formulation; (2) differentiation; (3) integration; (4) empirical value; and (5) legitimacy. In order to evaluate the argumentative process, in particular differentiation and integration are relevant.

5.1 Evaluating interactive backcasting

5.1.1 Differentiation

Differentiation in the backcasting exercises refers to both the variety of the options that were selected for the analysis, and to the variety of issues that were discussed in the actual analysis of the options. The four groups in the COOL project analyzed 22 different response options to climate change. The groups mainly selected options that they considered promising for achieving drastic GHG emission reductions, and/or particularly challenging to implement. The options differed from one another in several respects: some options concerned renewable energy options, others were based on fossil energy, and others referred to energy efficiency techniques; some options referred to a central system whereas others were characterized by decentralized applications; some options referred to an energy sources whereas others referred to an energy carrier, et cetera. Examples of options are: biomass, CO_2 storage and sequestration, wood cascading, underground transport, wind energy, hydrogen, and the heat pump. These examples show that the groups decided to mainly analyze technological response options to climate change, rather than, for example, policy instruments, or life style options. A possible explanation for this is that the scientific support unit, which provided the groups with scientific information, mainly included technical experts, as a result of which the groups mainly received information on the technical aspects of reducing GHG emissions rather than on policy and institutional aspects. As a consequence, the degree of differentiation in the selection of options was rather modest.

In the actual analysis of the options, the degree of differentiation was much higher. Although the starting point for the backcasting exercises mainly concerned a technological option, in the analysis, the groups also discussed various other aspects such as: governmental policy, consumer behavior, spatial planning, institutions, and market developments. Table 1 gives an overview of the obstacles and opportunities that were identified in the case of the large-scale implementation of biomass.

In many backcasting exercises, three main obstacles were brought up: low societal support, high costs, and the need for technological innovation. Also the current institutional arrangements, or the lack of these, were seen as an important obstacle. The groups called for a strong and consistent governmental policy in order to create the right market conditions for business and industry to invest in the development of specific options. This was, for instance, the case in the Agriculture & Nutrition Group. This group claimed that the global climate regime on the biomass option needed to be changed, as it currently provides incentives for inefficiently dumping biomass from the forest straight into the oven, which hampers the optimal cascading of wood. The call for a strong and consistent government was in complete contrast with the Dutch government's current movements of retreat, which are motivated by the internationalization and liberalization of the energy market.

Table 1: Obstacles and opportunities for biomass as identified by the stakeholders (Van de Kerkhof, 2004)

Opportunities for biomass	Obstacles for biomass
• New markets and the increase of revenues and employment • Use of degraded lands • Restoration of land and prevention of erosion • Technological innovation to increase crop yield per hectare • Development of conversion techniques in existing industrial infrastructure and export of technologies • Development of an international strategy for the implementation of biomass • Biomass fits the ideas of current climate policy • Cascading to optimize the use of biomass • Improvement of the image of the sector • Decrease of the negative environmental effects of transport	• Large demand for land and competition with other claims on land • Dependence of other countries due to need to import biomass • Need for new and improved conversion techniques • High costs due to the need for a biomass transportation system and a new energy infrastructure • Environmental effects are not integrated into the price of energy • Low societal acceptance due to high demand for land • Need for institutional arrangements for large-scale implementation of biomass • Lack of interest in the automobile industry to switch to bio fuels • Uncertainty about the safety of fuel cells • Threat to biodiversity due to large-scale growth of mono crops • The global climate regime hampers the optimal cascading of wood

5.1.2 Integration

Integration in the backcasting exercises refers to the extent to which the groups made argued choices for what they defined as important problems and ways to solve these problems. In order to indicate the degree of integration in the COOL project, I will take the large-scale implementation of biomass as an example again. Three of the four groups analyzed this option: the Industry & Energy Group, the Traffic & Transport Group and the Agriculture & Nutrition Group. The first two groups both claimed that, in order to cover a large part of the energy use in the Netherlands with sustainably produced biomass, in particular the problems with regard to the demand for land and with regard to logistics need to be dealt with. The groups supported their claim with the technical warrant that, since only a minor part of the required biomass can be produced in the Netherlands, the large-scale implementation of biomass requires the production of biomass in other countries. A normative warrant to support the claim was that the production of biomass for the Dutch energy market should not be at the cost of other claims for land abroad, such as the production of food, recreation, housing, and nature development. This warrant was based on the backing that the Netherlands should not pass on its problems to other countries. The option to use degraded lands for the production of bio-crops can be seen as a rebuttal for the claim. These lands do meet the standards for food production, but are still suitable for growing bio-crops.

The participants in the Agriculture & Nutrition Group acknowledged these problems as well, but considered the relatively high costs of biomass, compared with the costs of fossil energy options, the most important problem. They argued that, as long as the environmental costs of fossil energy are not integrated into the price, the biomass option will not be able to compete with fossil energy options.

Like in the biomass example, in most backcasting exercises, the groups used several—both technical and normative—warrants, backings and rebuttals to strengthen their claims (see Van de Kerkhof, 2004, chapter 8, for a more detailed analysis). Unfortunately these different claims and arguments were not sufficiently discussed, which limited the opportunities for second-order learning. The backcasting procedure in the COOL project had a brainstorming character and did not provide methodological guidance for the integration of the outcomes of the separate backcasting exercises, neither within a group nor across the four groups. As a result, the options were mainly analyzed in isolation from one another and the confrontation between different viewpoints remained limited. This points to a rather moderate degree of integration in the backcasting exercises.

5.2 Evaluating repertory grid analysis

5.2.1 Differentiation

Differentiation in repertory grid analysis refers to the variety of constructs that the participants brought up in the interviews. The average number of con-

Table 2: Constructs produced by the Industry & Energy Group of the COOL project (Van de Kerkhof, 2004)

High cost effectiveness	low cost effectiveness
Need for techn. innovation	option already available
High societal support	low societal support
Central level	decentralized level
Supply side	demand side
Renewable energy	fossil energy
No safety risks	option not fully safe
Broadly applicable	limited applicable
Focus on direct CO_2 reduction	energy efficiency
Permanent CO_2 reduction	temporary CO_2 reduction
High innovation potential	low innovation potential
Secure energy supply	risk of shortages
High spatial constraints	low spatial constraints
Controllable by government	not controllable
Need for incentives	no need for incentives
Source-oriented	end-of-pipe oriented

structs that the groups in the COOL project produced was about 14. Table 2 is an example of the constructs that were produced in the Industry & Energy Group. The table makes clear that each construct is bipolar, meaning that it consists of two opposite dimensions—typically these were 'high' and 'low'. The constructs related to different aspects of GHG emission reduction and climate policy, such as: technological (e.g., technical reliability), societal (e.g., societal support), economic (e.g., cost effectiveness), and institutional (e.g., controllability) matters.

A number of constructs were mentioned in more than one group. This specifically concerned: cost effectiveness, technological innovation, the level of application (central or decentralized), and the position of an option in the chain of products and services (demand or supply side). Apparently, these were important matters in each sector. Towards the end of the phone interviews, hardly any new constructs were coming up anymore. Apparently, repertory grid analysis gave a rather comprehensive overview of constructs that the participants in the COOL project considered relevant for GHG emission reduction and long-term climate policy. This leads to the conclusion that the degree of differentiation in repertory grid analysis was rather high.

5.2.2 Integration

Integration refers to the extent to which the groups explored different (conflicting) claims and arguments and made choices with regard to criteria for climate policy. As explained earlier, in the procedure of repertory grid analysis, the respondents were first asked to formulate a specific construct and then were asked to indicate which pole of the construct they preferred for long-term climate policy. This resulted in a list of preferences, which the groups used to formulate nine policy criteria (see Table 3). From these nine criteria, the groups in the COOL project unanimously concluded that climate policy in the Netherlands should foster options that satisfy the criteria: climate effectiveness, sustainability, social support, and cost effectiveness. Yet, it seemed from repertory grid analysis that the criteria are not always compatible, and may even be in conflict. At this point, the opinions in the project diverged. The participants had different views and expectations with respect to what is feasible and socially acceptable, given the current state of technology.

To illustrate the COOL discussions on these matters, it is useful to take an example of the Housing & Construction Group and the Industry & Energy Group. The claim of the Housing & Construction Group was that long-term climate policy should particularly focus on renewable supply options at the level of individual dwellings. The group considered 'sustainability', 'social support', and 'consumers' freedom of choice' to be the most important criteria. The criterion 'cost effectiveness' was subordinate to the criterion 'sustainability' and was defined as the costs per ton of sustainably-reduced CO_2. This means that the group only considered an option to be cost effective when it reduces a large amount of CO_2 at relatively low costs and in a sustainable manner. A warrant to support the emphasis on renewable options was that the group expected that, in the long run, consumers will no longer opt for non-sustainable options, even if these are cheaper. A warrant to support the focus on the level of the individual dwelling was that this would increase the consumers' freedom of choice. The group highly valued consumer sovereignty in long-term climate policy and expected that this would become even more important in the future. This criterion could conflict with the criterion of cost effectiveness, as some options will only be cost effective if they are applied on a very large scale (e.g., hydrogen). However, the group did not explore this potential conflict further.

In the Industry & Energy Group other criteria played a role. In particular the criteria 'CO_2 effectiveness', 'cost effectiveness', and 'market conformity' led to the claim that long-term climate policy should not focus on a specific technology, but should leave several options open. The main warrant for this claim was that all the options are needed in order to achieve drastic reductions of GHG emissions of 80 percent compared with 1990 levels. Another warrant was that there will be a selection of options by the market mechanism. The rebuttal was that there are specific circumstances, such as safety risks, on account of which an option should not be applied. However, these criteria can conflict with other criteria that were considered important. For instance, there seems to be a possible conflict between cost effectiveness and sustainability, and between CO_2 effectiveness and innovation potential. Although some of these conflicts were acknowledged, they were not sufficiently discussed. In addition to conflicts within the group, there was also a potential conflict with the Housing & Construction Group. In contrast with this group, the Industry & Energy Group did not include the notion of sustainability and understood cost effectiveness as the costs per ton of CO_2 reduced. This implies that given a choice

Table 3: Criteria for climate policy as developed by the stakeholders in the COOL project (Van de Kerkhof, 2004)

Criteria for climate policy according to the COOL project	
Climate effectiveness	The extent to which, in the long term, climate policy actually contributes to reducing the emissions of GHGs
Sustainability	The extent to which climate policy contributes to a socially, ecologically, and economically sustainable society in the long term
Social support	The extent to which the different actors in society support long-term climate policy. This implies that the climate policy should follow the current developments in the sector concerned, and that the consumer should actively be involved in this policy
Cost effectiveness	The extent to which, in a choice between options, the alternative that realizes the highest reductions against the lowest costs will be preferred.
Consumers' freedom of choice	The extent to which climate policy increases consumer sovereignty. This is expected to have a positive effect on the social support for climate policy.
Governmental/ administrative fit	The preference for those options that can be implemented with the current set of instruments in the Netherlands, or that are compatible with European rules.
Consistency of governmental policy	The need for resolving the tension that several participants in the dialogue spotted between climate policy and the liberalization of the energy market.
Technical reliability	The robustness of options. Some link this criterion to a preference for simple, low-tech options with a long lifetime and which are easy to repair if something goes wrong. The dominant culture has a bias in favor of high tech, yet relatively vulnerable options.
Potential for innovation	The capability of an option to generate further sustainable technological innovations. The assumption that underlies this criterion is that large-scale innovations will be needed, since the degree of sustainability of options, such as CO_2 storage and biomass is doubtful.

between options, the alternative that realizes the highest reductions at the lowest costs will be preferred, whereas, according to the Housing & Construction Group, the consumer would choose the sustainable alternative, even if this is more expensive.

According to the evaluation of repertory grid analysis in the COOL dialogues (see Van de Kerkhof, 2004, chapter 9, for a more detailed analysis) repertory grid proved to be an appropriate method to integrate the outcomes of the separate backcasting exercises, and to help the groups to formulate criteria for climate policy. The evaluation of the claims and arguments on policy criteria leads to the conclusion that the outcomes of repertory grid analysis revealed a number of inconsistencies and conflicts between and within the groups, which had so far remained implicit in the dialogue. Repertory grid analysis encouraged second-order learning by unfolding participants' categorizations, articulating personal preferences, and bringing to light contradictions in individual thought processes. Even supposedly undisputed facts, such as the definition of demand and supply options, could, on the basis of what repertory grid analysis delivered, no longer be taken for granted. Observations of the workshops indicate that the capacity of repertory grid analysis to reveal inconsistencies was not always welcomed with great enthusiasm, as for some participants it was unclear how to deal with them. The result of this was that the inconsistencies and tensions were highlighted, but that the project team did not manage to get the groups to discuss these inconsistencies and conflicts further. This points to a more moderate degree of integration than repertory grid analysis seems to be capable of.

6 Challenges for interactive sustainability research

In this article, I have argued that in particular to enhance second-order learning, a dialogue approach needs to actively stimulate the participants to explore conflicting claims and arguments about the topic that is being discussed. The COOL case has made clear that, particularly at the start of the dialogue when the participants still felt a bit uncertain and were not yet familiar with one another, they had the tendency to seek a consensus. A lack of dialogue design and methods to encourage argumentation may then lead to the a priori exclusion of specific viewpoints and opinions that may stand in the way of reaching a consensus. The methods that are evaluated in this article are interactive backcasting and repertory grid analysis.

This final section presents a number of challenges for the future of interactive sustainability research. These challenges concern the potential of interactive backcasting and repertory grid analysis to stimulate the argumentative process, as well as research that needs to be done on evaluating the quality of argument.

6.1 Improve the integrative qualities of backcasting

Interactive backcasting in the COOL project turned out to be fun, dynamic, and lively, and the participants very positively evaluated the method. Notwithstanding this, the evaluation of the COOL project leads to the conclusion that the backcasting exercises were less of an argumentative process that the project team had expected. The backcasting procedure did enable the groups to explore a large number of options in a relatively short period of time, and to identify the most important issues ('the big hits') and the crucial problems in the implementation of these options, but the analysis of claims, warrants, backings, and rebuttals made clear that the procedure did not sufficiently facilitate the exploration of conflicting arguments, particularly on issues like the identification of the most important problem. The characteristics of interactive backcasting, such as a heterogeneous group composition, and a transparent procedure of the method, did create the right conditions for an argumentative process, but apparently this was not enough. Therefore, the interactive backcasting procedure, as it was used in the COOL project, needs to be improved. Especially in the light of the increasing attention for 'transition management'[4] in the Netherlands, in which backcasting is often proposed as an appropriate method to explore transition processes, this can be considered an important challenge for the future of interactive sustainability research.

One way of improving the learning effect of interactive backcasting (particularly at the second-order level) is to apply the 'second generation' form of backcasting as proposed by Robinson (2003), in which the desired future is not determined in advance of the analysis (like we did in the COOL project) but is rather an emergent property of the stakeholder process. In this alternative form of backcasting, the stakeholders go through an iterative process of learning and discovery in which they might change their minds about what is a desirable future based on the consequences of different choices that they can make (one could use a computer model to support this).

Another way to improve the backcasting method as applied in the COOL project is to give a stronger role to the moderator, who takes an active role by asking the participants in the backcasting exercise to clarify their statements and justify these with arguments. More important, however, is to add an additional step to the backcasting procedure, in which the participants discuss the different backcasting exercises in relation to one another in order to point out where they show overlap with one another, and where there may be inconsistencies and/or conflicts. It is also possible to ask scientific experts to review the outcomes of the backcasting analyses, in order to reveal inconsistencies or gaps in the argumentation.

Another aspect that is important to take into account is to make sure that the participants in the backcasting exercises receive scientific information that is diverse, in that it addresses a variety of (technical and non-technical) aspects and does not conceal scientific uncertainties or controversies. This will encourage them to explore different claims and arguments and to make an informed

[4] In 2001, a new approach towards environmental policy was introduced in the Netherlands with the fourth National Environmental Policy Plan (NEP4) and adopted by almost all departments. The document introduced the concepts of transitions and transition management as the new approach towards environmental and, related to that, societal problems. The NEP4 focused on four main issues: energy, biodiversity, agriculture, and mobility.

judgment on issues like the most important problem.

6.2 Develop an interactive application of repertory grid analysis

With regard to repertory grid analysis, the evaluation of the COOL project indicates that this is a suitable method to elicit the constructs that guide people's way of thinking and behavior, and to encourage the participants to explore the conflicting arguments and assumptions on which these constructs are based. It must be noted that the experience with repertory grid analysis in the COOL project in the Netherlands is less positive than the experience in the US (Dunn, 2001). It is likely that Dutch respondents are suspicious of the rather open questions. However, given the actual results, this less positive experience should not be a reason to abandon the repertory grid method. What is important, though, is that in order to avoid irritation among the participants the goal and procedure of the method should be clearly explained to them. Furthermore, it would be interesting to not only use the method in individual phone interviews, like in the COOL project, but to also apply repertory grid in an interactive manner. This means that the participants in the dialogue interactively explore the different constructs that play a role with regard to a specific topic, and develop rankings according to these constructs. This may be a good way not only to develop policy criteria, but also to identify other outcomes, e.g., future images.

6.3 Design criteria to evaluate the quality of argument

In this article, I used two criteria to evaluate the quality of argument—differentiation and integration—and I used Toulmin's model to evaluate the lines of argument in terms of claims, warrants, backings, and rebuttals. By using these criteria, the quality of the argumentative process is related to (1) the 'nature' of the arguments that are used to underpin certain claims; relating to technical, political, social, cultural, institutional, and economic aspects of the issue under consideration, and (2) the way in which the participants deal with these different arguments, and the possible conflicts and inconsistencies between them, when they need to make choices for specific policy priorities and recommendations.

However, the problem with using these criteria in the COOL project was that they did not allow for a systematic comparison of the quality of the argumentative process in the respective phases of the dialogue and/or in the four different groups. For instance, the use of the criterion 'differentiation' gave insight into the variety of topics that were taken into account in the discussion, but it did not make it possible to judge whether the degree of differentiation was sufficient or not, or whether it had increased compared with the previous phase of the dialogue. This means that the use of these criteria needs to be improved. It may be useful to conduct a repertory grid analysis at the start of the dialogue, in order to get insight into the range of relevant issues already at an early stage. The outcomes of repertory grid analysis will then be the point of reference for the evaluation of the degree of differentiation in the different stages of the project.

6.4 Try to reach a true consensus

The main argument of this article that a dialogue should be designed in such a way that it actively encourages a process of argumentation does not mean that reaching consensus is neither important nor desirable. Most probably, a dialogue will have more impact on the policy-making process, and the participants will be more satisfied, if they manage to reach a consensus. However, consensus will only be valuable if it is a 'true' consensus, which means that the participants reach an agreement that is based on the exploration and discussion of all the relevant viewpoints and arguments in relation to the topic, including controversial and minority viewpoints. In reality, reaching a true consensus is not easy as the differences in interest and viewpoint may be too large. When that is the case, the dialogue should aim for 'convergence', which refers to a process in which the participants explore to what extent, and under what circumstances, consensus exists or can be achieved on specific topics, but also to explore to what extent they disagree on specific topics.

The COOL case revealed that an open dialogue process, in which the participants were encouraged to articulate, and deliberate on, the different viewpoints and ideas that existed in the group, eventually made it easier to identify a number of issues on which the participants actually agreed. These issues were translated into a number of specific policy recommendations for climate policy.

This article contributes from the field of policy analysis to the further strengthening and improvement of dialogue approaches. The ambition to focus the design of dialogue approaches on argumentation and learning is a challenging one, in which more research is needed and more experience has to be gained in order to further promote the transition towards sustainability.

7 Bibliography

Andersson, M., Tuinstra, W. & Mol, A. P. J. (2002), Climate OptiOns for the Long term (COOL)—European dialogue, NRP report nr. 410200117, Wageningen University. 15

Argyris, C. & Schön, D. (1978), *Organisational learning. A theory of action perspective*, Addison-Wesley Publishing Company, Massachusetts, USA. 13

Arnstein, S. R. (1969), 'A ladder of citizen participation', *Journal of the American Institute of Planners* **35**(4), 216–224. 11

Berk, M., Hordijk, L., Hisschemöller, M., Kok, M., Liefferink, D., Swart, R. & Tuinstra, W. (1999), Climate OptiOns for the Long term (COOL). interim phase report, NRP Report nr. 410200028, NRP. 10

Berk, M., Minnen, J. G. v., Metz, B., Moomaw, W., Elzen, M. G. J. d., Vuuren, D. P. v. & Gupta, J. (2001), Climate OptiOns for the Long term (COOL). global dialogue synthesis report, RIVM nr. 490200003, RIVM. 15

Brown, H. S., Vergragt, P., Green, K. & Berchicci, L. (2003), 'Learning for sustainability transition through bounded socio-technical experiments in personal mobility', *Technology Analysis & Strategic Management* **15**(3), 291–315. 13

Carmichael, J., Tansey, J. & Robinson, J. (2004), 'An integrated assessment modeling tool', *Global Environmental Change* **14**(2), 171–183. 17

Cooke, B. & Kothari, U., eds (2001), *Participation. The new tyrrany?*, Zed Books, London, U.K. 10

Dreborg, K. H. (1996), 'The essence of backcasting', *Futures* **28**(9), 813–828. 16, 17

Dunn, W. (1988), 'Methods of the second type: Coping with the wilderness of conventional policy analysis', *Policy Studies Review* **7**(4), 720–737. 14

Dunn, W. (1994), *Public policy analysis. An introduction.*, Prentice Hall, New Jersey, USA. 20

Dunn, W. (2001), Using the method of context to mitigate Type III errors in environmental policy analysis, *in* M. Hisschemöller, R. Hoppe, W. Dunn & J. Ravetz, eds, 'Knowledge, power and participation in environmental policy analysis', Transaction Publishers, New Jersey, USA. 18, 19

Dunn, W. & Ginsberg, A. (1986), 'A sociocognitive approach to organisational analysis', *Human Relations* **39**(11), 955–875. 18

Elmore, R. (1980), 'Backward mapping: Implementation research and policy decisions', *Political Science Quarterly* **94**, 601–616. 16

Etheredge, L. (1981), Government learning: An overview, *in* S. Long, ed., 'The handbook of political behavior', Vol. 2, Pergamon, New York, NY, USA. 13

Fischer, F. (2000), *Citizens, experts and the environment. The politics of local knowledge*, Duke University Press, London, U.K. 9

Gieryn, T. (1995), Boundaries of science, *in* S. Jasanoff, G. Markle, J. Petersen & T. Pinch, eds, 'Handbook of science and technology studies', Sage Publications, California, USA, pp. 393–443. 8

Habermas, J. (1970), 'Towards a theory of communicative competence', *Inquiry* **13**, 363–372. 14

Hall, P. (1993), 'Policy paradigms, social learning and the state. the case of economic policy-making in Britain', *Comparative Politics* **1993**(April), 275–296. 13

Heclo, H. (1974), *Modern social politics in Britain and Sweden: From relief to income maintenance*, Yale University Press, New Haven, CT, USA. 13

Hisschemöller, M. & Hoppe, R. (2001), Coping wtith intractable controversies: The case for problem structuring in policy design and analysis, *in* M. Hisschemöller, R. Hoppe, W. Dunn & J. Ravetz, eds, 'Knowledge, power and participation in environmental policy analysis', Transaction Publishers, New Jersey, USA, pp. 47–72. 14

Hisschemöller, M., Kerkhof, M. v. d., Kok, M. & Folkert, R. (2002*a*), Climate OptiOns for the Long term (COOL): Stakeholders' view on 80% emission reduction., *in* M. Kok, W. Vermeulen, A. Faaij & D. de Jager, eds, 'Global warming and social innovation: The challeng of a Climate Neutral Society', Earthscan, London, UK. 15

Hisschemöller, M., van de Kerkhof, M., Annema, J. A., Folkert, R., Kok, M., Spakman, J., Faaij, A., Treffers, D. J., de Jager, D., Jeeninga, H., Kroon, P., Seebregts, A. & Spanjersberg, M. (2002*b*), Climate OptiOns for the Long term (COOL)—Nationale dialoog., Final Report—Volume B. NRP Report nr. 410200120, NRP. 15

Hoogerwerf, A. (1990), 'Reconstructing policy theory', *Journal of Evaluation and Program Planning* **13**, 285–291. 20

Jasanoff, S. (1990), *The fifth branch. Science advisers as policymakers*, Harvard University Press, Cambridge, MA, USA. 8

Kelly, G. (1995), *The psychology of personal constructs*, W. W. Norton, New York, NY, USA. 18

Kickert, W. J. M., Klijn, E. H. & Koppenjan, J. F. M., eds (1997), *Managing complex networks. Strategies for the public sector.*, Sage Publications, London, U.K. 9

Lovins, A. B. (1976), 'Energy strategy: The road not taken?', *Foreign Affairs* **55**(1), 63–96. 16

Mason, R. & Mitroff, I. (1981), *Challenging strategic planning assumptions. Theory, cases and techniques*, John Wiley & Sons., New York, NY, USA. 8, 14

Mayer, I. (1997), *Debating technologies. A methodological contribution to the design and evaluation of participatory policy analysis*, Tilburg University Press, Tilburg, the Netherlands. 11, 12

Renn, O., Webler, T., Rakel, H., Dienel, P. & Johnson, B. (1993), 'Public participation in decision-making: A three-step procedure?', *Policy Sciences* **26**, 189–214. 8

Robinson, J. (1982), 'Energy backcasting. A proposed method of policy analysis', *Energy Policy* pp. 337–344. 16

Robinson, J. (2003), 'Future subjunctive: Backcasting as social learning', *Futures* **35**, 839–856. 16, 17, 28

Rosa, E. (1998), 'NAMBY PAMBY and NIMBY PIMBY: Public issues in the siting of hazardous waste facilities.', *Forum for Applied Research and Public Policy* **3**, 114–123. 9

Sabatier, P. (1988), 'An advocacy coalition framework of policy change and the role of policy-oriented learning therein', *Policy Sciences* **21**, 129–168. 13

Sabatier, P. & Jenkins-Smith, H., eds (1993), *Policy change and learning: An advocacy coalition approach*, Westview Press, Boulder, CO, USA. 13

Scholten, L. & Midden, C. (1992), 'Milieubelasting van verpakkingen: Effecten van de natuurlijkheidsbias op consumentenoordelen', *Milieu* **12**(4), 167–175. 10

Schumpeter, J. (1942), *Capitalism, socialism and democracy*, Harper and Row, New York, NY, USA. 9

Seley, J. (1983), *The politics of public facility planning*, Lexington Books, Lexington, USA. 10

Teisman, G. (1997), *Sturing via creatieve concurrentie. Een innovatieplanologisch perspectief op ruimtelijke investeringsprojecten*, KUN, Nijmegen, the Netherlands. 9

Teisman, G. (2001), Strategies for improving policy results in a pluricentric society: An interactive perspective on strategic policy behaviour, *in* W. Salet & A. Faludi, eds, 'The revival of stategic spatial planning', KNAW, Amsterdam, The Netherlands. 9

Toulmin, S. (1969), *The uses of argument*, Cambridge University Press, Cambridge, MA, USA. 20

Van de Graaf, H., Van Est, R. & Eberg, J. (1996), Beleidsverandering en beleidsgericht leren, *in* J. Eberg, R. Van Est & H. Van de Graaf, eds, 'Leren met beleid. Beleidsverandering en beleidsgericht leren bij NIMBY-, milieu- en technologiebeleid', Het Spinhuis, Amsterdam, the Netherlands. 13

Van de Kerkhof, M. (2004), *Debating Climate Change. A study of stakeholder participation in an integrated assessment of long-term climate policy in the Netherlands*, Lemma Publishing, Utrecht, the Netherlands. 8, 9, 13, 14, 18, 19, 22, 23, 24, 26, 27

Van de Kerkhof, M. & Wieczorek, A. (2005), 'Learning and stakeholder participation in transition processes towards sustainability: Methodological considerations', *Technological Forecasting and Social Change*. 9

Van de Kerkhof, M., Hisschemöller, M. & Spanjersberg, M. (2002), 'Shaping diversity in participatory foresight studies. experiences with interactive backcasting in a stakeholder dialogue on long-term climate policy in the Netherlands', *Greener Management International* **37**(1), 95–99. 16

Van der Knaap, P. (1997), *'Learning' government, intelligent policies. The lessons of policy evaluation and policy advice for the European Union structural funds*, Phædrus Publishing, The Hague, the Netherlands. 13

Van der Sluijs, J., Hisschemöller, M., de Boer, J. & Kloprogge, P. (2001), Climate risk assessments: Evaluation of approaches, Synthesis report, Utrecht University. 19

Van Kersbergen, K. & van Waarden, F. (2004), "Governance' as a bridge between disciplines: Cross-disciplinary inspiration regarding shifts in governance and problems of governability, legitimacy and accountability', *European Journal of Political Research* **43**, 143–171. 9

Vellinga, P. (2001), Industrial transformation—exploring systems change in production and consumption, *in* W. Steffen, J. Jäger, D. Carson & C. Bradshaw, eds, 'Challenges of a changing earth. Proceedings of the Globar Change Open Science Conference', The IGBP Global Change Series, Springer-Verlag, Heidelberg, NY, USA. 8

Vergragt, P. (2000), Strategies towards the sustainable household, Final report. SusHouse project, Delft University of Technology. 16

Von Winterfeldt, D. (1992), Expert knowledge and public values in risk management: the role of decision analysis, *in* S. Krimsky & D. Golding, eds, 'Social theories of risk', Præger Publishers, London, UK., pp. 321–342. 8

Weaver, P., Jansen, L., van Grootveld, G., van Spiegel, E. & Vergragt, P. (2000), *Sustainable Technology Development*, Greenleaf Publishing, Sheffield, UK. 16

Webler, T. (1995), Right discourse in citizen participation: An evaluative yardstick, *in* O. Renn, T. Webler & P. Wiedemann, eds, 'Fairness and competence in citizen participation. Evaluating models for environmental discourse', Kluwer Academic Publishers, Dordrecht, the Netherlands. 10, 14

Wynne, B. (1996), May the sheep safely graze? A reflexive view of the expert-lay knowledge divide, *in* S. Lash, B. Szerszynski & B. Wynne, eds, 'Risk, environment and modernity. Towards a new ecology', Sage, London, UK. 9