

**Project:**  
**The Landscape and Isobars of European Values in  
Relation to Science and New Technology  
(ValueIsobars)**

**Project number:**  
**230557**

**Title of deliverable\*:**  
**Protocol for role play of ethics council**

**Work package:**  
**WP3**

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**Deliverable 3.1**

**Date: July 14<sup>th</sup>. 2010**

\*: Acknowledgements:

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## Introduction:

Initially Value Dialogue was designed as a straight Role Play of ethics council that engages itself with two ethical issues of biomedical research, which were later chosen to be biometrics and the dual use dilemma of pathogen-research. The original approach has been modified due to the fact that these topics are not suitable for discourse in an ethical council framing. We thus modified the Value Dialogue concept to an appropriate framing with role-playing elements that focuses on enabling and fostering decision making processes and value centred discussions of the selected topics.

The guiding principle of Value Dialogue as a participatory action research approach is to develop new ways to close the gap between available technological possibilities and the ethical doubts and down-to-earth distrusts of the general public according to S&T and its applications for a common good. Therefore we will devise a pilot-study to explore possibilities of dialogue-oriented participation instruments in order to improve the transfer of social values from general public into governance-regulations regarding S&T. Value-based guidelines and regulations as an indirect output of this dialogue platform should give scientists and policy-makers a better orientation about the moral issues and the needs and visions regarding future, development and progress that are commonly perceived by the general public. To develop these kind of value-based guidelines Value Dialogue has in a first step to pursue the objectives to identify public's views and expectations and to work out commonly perceived scenarios and criteria, which are perceived as relevant regarding options and possibilities of technological and societal development. This should enable us to then identify core values for the guidelines. Values in this context are perceived as attractors however they are rarely named in discourse. Therefore the attitudes, views, scenarios and opinions have to be identified and only then the underlying values can be elaborated.

To exploit respectively to evaluate the possibilities of Value Dialogue two highly complex and ambiguous topics have been selected, namely biometrics and the dual use dilemma regarding pathogens. These two topics will each be discussed in a participatory process that mainly consists of two round tables. In these round tables the Value Dialogue participants try to find an agreement or a consensus on how to cope with the challenges, risks and uncertainties of these topics and attempt to find a common sense on chances that these technologies offer and on how to benefit from these attractions.

The first round table is designed as a process-oriented and open consultation in which the information input is as low as possible. The second round table is outcome and consensus oriented and will take place in form of a students parliament, namely in form of delegate boards at the Austrian Science Parliament.

Value Dialogue is not only seen as participative act that shows the potential of consensus of general public in that area but also is understood as a procedure that makes visible social values as drivers of attitudes and opinions via discourse analysis.

Besides discourse analysis Value Dialogue will use Multicriteria-Mapping, guided interviews and in-depth interviews to explore values and attitudes that are relevant in this area. Further characteristics of Value Dialogue are that Value Dialogue as participative framing doesn't include stakeholders or experts due to the notion that basic social values should be easier to extract out of rather non-strategic and non-persuasive communication acts<sup>1</sup> and due to the goal to democratize scientific practices to a greater extent by focusing on lay people and on general public.

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<sup>1</sup> Note: Strategic and persuasive communication acts understood in the sense of Habermas' discourse theory.

# Protocol of Value Dialogue:

## Phases of Value Dialogue:

### Step 1, Assessment phase:

- ) Method-design and -adaption due to relevant progress
- a.) Pretest: guided interviews and Multicriteria-Mapping (MCM), (questionnaires and telephone interviews optional)
  - > interims analysis

### Step 2, Appraisal phase:

- b.) Round table 1: open designed group discussion
- c.) Input by experts

### Step 3, Risk management phase:

- d.) Round table 2: Two panels in the participative framing 'Science Parliament' (integrates role play and scenario-building elements, besides two experts will support the panel by answering questions posed by the panel) have the task to find a consensus/compromise and write a closure declaration.
- e.) narrative interview/depth interview

### Step 4, Analyzing and communication phase:

- f.) Final analysis; Critical discourse analysis and evaluation of the framing in general and the closure-process in special.
- g.) Final report/summarizing conclusion

The Assessment phase has the function to provide first information on possible and probable dynamics in Step 2 and 3. Especially the interest is focused on the question of how much information and moderation input is necessary for the discussions on the selected topics to go on.

Furthermore knowledge gained through the interim analysis of Step 1 should also deliver insights on the need to develop and insert certain scenarios to frame the dual use dilemma and the biometrics issues for the discussions constructively regarding underlying values.

First conclusions about the probable direction discourse takes and about the linked topics, themes, principles, norms, attitudes preferences, etc. should be drawn as far as possible after the interims analysis of the outputs of MCM and the guided interviews.

MCM is seen as a method that offers the assets to depict a problem-area by making visible the spectrum of options and criteria and the chances and risks being perceived by people in that field and that are realized as important by them. Furthermore MCM also appears to be a fruitful instrument to explore possible value trade-offs and the hierarchy of conflicting values regarding an individual and a common good.

Besides MCM a not standardized, little structured, oral interview with a soft/weak interviewer and open and indirect questions has been selected as adequate instrument for first exploration. Questionnaires will be used optional as a supplementary tool, due to the notion that the range, complexity and ambiguity of the two selected topics could easily overburden respondents and thereby produce artefacts.

The Appraisal phase consists of round table\_1 and a rather short input lecture by experts. Round table\_1 is designed with focus on deliberation and consultation, not on decision-making. It is process-oriented and not outcome-oriented. Round table\_1 is designed as a

postmodern and deliberative concept of participation and its basic concern is to handle and respect the plurality and diversity of the general public and of the panel participants in particular. It also focuses on capacity-building by reflecting the topic-specific capabilities of the participants and promoting their views as inputs for governance-outcome. (see Renn, 2008: p.325)

The expert-input has the function to give the participants the information that empowers them to make meaningful decisions on the subjects and to increase the participants feeling of competence so that they are capable of tapping the full potential of the ethical and rational competence and of the traditional knowledge that they provide for round table\_2.

The Risk Management Phase consists of round table\_2 that takes place in the framing of a parliament boards and in-depth-interviews. The parliament boards - and their improvement by gained experiences - is the core and the foundation of the new group exercises that are to be developed. These parliament boards are part of the Austrian Science Parliament, which is a student parliament focusing on topics with life science reference.

The parliament board is designed as a closure-oriented participative format and a neo-liberal and anthropological concept of participation (see Renn, 2008: p.303). At the end the participants should find a consensus or a compromise or at least come to an agreement about a final declaration which summarizes the key points and arguments that made a consensus not possible.

This consensus-finding process is fostered by the role-play element of taking the position of delegates.

Besides as support for the parliament board scientific advice and information will be provided by two experts who will answer to questions posed by the panel.

This Round table\_2 is designed as decision-influencing participation format, a fact that should motivate the participants to take the task seriously and to accurately and thoroughly consider all aspects of the problem that are accessible to them.

The provided expert advice has the function to foster the participants to feel competent and encourages them to contribute to the outcome and to improve it.

In a second step the Risk Management phase consists of in-depth-interviews of the participants. Decision-making and closure-oriented participation concepts mostly use rules/modes of arguing respectively of legitimizing evidence, claims and priorities regarding different rationalities and non-rationalities. Rational methods of consensus-finding and decision-making and their rules of discussion are not neutral but promote specific logics. This factor may be named 'Persuasive rationality'(see Becker, 1950). Another factor that perhaps influences the process of decision-making would be peer-pressure. To track down this kind of factors and to evaluate the framing the participants are interviewed regarding their experiences with the format, regarding their satisfaction with the outcome, how they think their point of views and their opinions and values have been able to influence the process, and also the question if in that process they perhaps have conceded to points that they cannot accept outside the frame/scope of this participation process.

In the Analyzing phase the transcripts of the round table one and two are exploited via discourse analysis. Discourse analysis as an interpretive-analytical method that is able to comprehend '*das Sagbare und das Sagenswerte*'<sup>2</sup> regarding a topic, meaning that it is designed to explore what is worth being said on a topic, what is socially accepted to be said and what is possible to be said on a topic at a certain time and in a certain social context. Therefore it seems to be the method with the most potential to explore the attitudes, views and

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<sup>2</sup> Note: "Das Sagbare und das Sagenswerte" means 'the possible-to-say and the worth-to-say'.

values of the participants on these highly ambiguous and complex topics profoundly and adequate.

## Conclusion

During the design process of Value Dialogue the spectrum of decision making instruments has been screened<sup>3</sup>. The decision to integrate MCM in the assessment phase but to drop the use of other decision-making methods was pragmatic and theory based, i.e. the notion that most decision-making tools and their inherent rationalities and logics strongly influence direction of deliberation and its characteristics (the kind of reasoning and truth claims)<sup>4</sup>. Pragmatic grounds comprehend e.g. the degree of complexity of the tool in order to not overburden the sample by e.g. mathematically centred tools, and the logistic extent of the exercise that has to fit in the frame of a pilot study.

Also different participation-processes have been screened and their potentially useful inputs for Value Dialogue have been checked. As we intend to mainly simulate the discussions of general public respectively of lay people we designed the participation framing as an open process regarding content and the directions deliberating may take. Furthermore Value Dialogue is designed without stakeholders, which means that we have dropped the idea to use Charrette, World Café, Delphi-method, fish bowl, Neo-Socratic Dialogue etc. as a framing, because e.g. Charrette as an intensive process, where actors gain some kind of expertise, may favour discussion directions where scientific arguments overlay perspectives on social values for a common good founded in the general public. NSD as a strongly dialogue- and understanding-oriented participation concept may also overlay or shift the rifts normally found in value-based general public discussions, because dialogue and understanding probably don't have as much importance and relevance in public and private discussions in real life situations, while World Café could face the problem of an expert-lay-people hierarchy.

These strategic decisions are also grounded on the fact that Value Dialogue understands itself as a supplementary tool to procedures of representative democracy and to already established and existing participation processes. Value Dialogue's implicit goals are to increase citizen proximity to science and research and to democratize the scientific practice to a greater extent, due to the perspective that research and scientific findings determine the future and the way of life of people widely, but general public mostly doesn't take part in defining relevant values and visions of a common good that determine and influence the direction of technological and scientific developments and its consequences. Value Dialogue can be understood as an attempt to promote the role and significance of general public in shaping future. Self-explanatory democratization of scientific practices and commonly shared goals on development and progress also increase legitimation and public acceptance of S&T and its applications.

The focus of Value Dialogue on lay people and the exclusion of stakeholders and experts as participants is grounded on this too. This should promote an empowering process of citizens, where participants feel enabled to take part in decisions and that their serious contribution is meaningful independent of their expertise.

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<sup>3</sup> Note: For more information about the screened decision making and participation instruments see at the discussion paper in the appendix.

<sup>4</sup> Note: We took into consideration to use decision making and appraisal methods like Pro & Con analysis, Maximin-, Minimax-, Maximax-criteria, Value tree, Multi attribute utility in our participation concept, but we dropped that, because we think, that if we suggest these rules and logics to the actors for decision making it would be possible, that they disregard social values that would influence their expressed attitudes under 'normal/natural' circumstances. Nevertheless we plan to integrate Multicriteria-Mapping into the pretest, as it gives probably a good overview over criteria and options important to general public in that topic field.

Value Dialogue is designed as a process-oriented as well as outcome-oriented participation instrument that integrates consultation and decision-influencing components and contains analytic and deliberative forms of decision-influencing.

In the typology of dialogue-oriented participation procedures it is more related to formats like Citizen Jury or in its upscale-version to Deliberative Polls than to hearings, forums and advisory committees or councils.

Due to the character of the selected topics Value Dialogue has much in common with participatory processes that focus on risk management but it is extended by an analytic-interpretative dimension.

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[www.interscience.wiley.com](http://www.interscience.wiley.com)

## Timetable Value Dialogue:

### Ethical Council – pilot for new group exercises:

#### Step 1, Assessment phase:

- |                             |                    |
|-----------------------------|--------------------|
| a.) Pretest:                | <b>Month 20-22</b> |
| guided interviews           | Month 20-22        |
| Multicriteria-Mapping (MCM) | Month 20           |
| b.) interims analysis       | Month 21           |
|                             | Month 21 and 22    |

#### Step 2, Appraisal phase:

- |                      |                 |
|----------------------|-----------------|
| c.) Input by experts | <b>Month 21</b> |
|                      | Month 21        |

#### Step 3, Risk management phase:

- |   |                    |
|---|--------------------|
| d.) Round table_2:                      | <b>Month 21-22</b> |
|   | Month 21           |
| e.) narrative interview/depth interview | Month 22           |

#### Step 4, Analyzing and communication phase:

- |   |                    |
|---|--------------------|
| f.) Final analysis of Ethical Role Play | <b>Month 23-24</b> |
| g.) Report                              | Month 23-24        |
|   | Month 24           |

### New Group Exercise:

#### Step 1, Assessment phase:

- |                             |                 |
|-----------------------------|-----------------|
| a.) Pretest:                | <b>Month 25</b> |
| guided interviews           | Month 25        |
| Multicriteria-Mapping (MCM) | Month 25        |
| b.) interims analysis       | Month 25        |
|                             | Month 26        |

#### Step 2, Appraisal phase:

- |                      |                    |
|----------------------|--------------------|
| c.) Round table 1:   | <b>Month 27-28</b> |
| d.) Input by experts | Month 27           |
|                      | Month 28           |

#### Step 3, Risk management phase:

- |   |                 |
|---|-----------------|
| e.) Round table 2:                      | <b>Month 28</b> |
| f.) narrative interview/depth interview | Month 28        |
|   | Month 28        |

#### Step 4, Analyzing and communication phase:

- |                                       |                    |
|---------------------------------------|--------------------|
| g.) Final analysis new group exercise | <b>Month 28-30</b> |
| h.) Final Report                      | Month 28-29        |
|                                       | Month 30           |

## **APPENDIX:**

### **Value Dialogue**

**Discussion paper prepared for the Value Isobars synthesis workshop  
in Hamburg March 2010**

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## Introduction

There appears to be an increasing realization in governmental, scientific, and industrial bodies to become more accountable, responsive to the public, and involve it in policy decision making when feasible (e.g., Rosener 1978; Renn 1992; Vaughan 1993). A key driver is the failure of technical-expert and bureaucratic-rationalist modes of option appraisal to engage effectively with the knowledge, values and interests of stakeholders and wider society (Burgess, 2007). Participation allows the public to voice their opinion during and ideally contribute to any decision making process. While from the administrative point of view participation might be seen as a process to build public support for specific projects, citizens might be motivated by the perspective to influence decisions. Participation is seen as a way to clarify different, often opposite, views and interests regarding a specific problem, and a way to improve the quality of the decision making by ensuring fair and democratic processes (Bulkeley and Mol, 2003).

The European Commission stated participation as one of five principles of good governance and claims a “reinforced culture of consultation and dialogue” (Commission of the European Communities, 2001a). Citizens shall “become partners in the debate on science, technology and innovation in general and on the creation of the European Research Area in particular” and thus “must be given the opportunity to express their views in the appropriate bodies” (Commission of the European Communities, 2001b). Participation shall create more confidence in the policy chain and its end results (Commission of the European Communities, 2001a). Expertises shall be brought in line with public opinions and values (Renn, 2006). There certainly is a need for scientific expertise to establish well-founded decisions but it is not sufficient. Public values and preferences are required for broadly approved decisions and policies (Renn, 2006). Renn (2006) points at the difficulty that public perceptions may be based on false assumptions or anecdotal evidence. If it comes to values, a dilemma is the question who it is to decide which values should guide decision making in a pluralist society (Renn, 2006). The recently conducted referendum in Switzerland banning the construction of minarets illustrates this dilemma. This “citizen centric” approaches have their limitations and drawbacks. Processes oriented towards exploring the contending merits of a range of policy alternatives, without forcing closure around just one, might yield more transparent, accountable and robust outputs for governance. The challenge is to create “a decision framework that stresses not only technical information but also the explicit input of values, insights and tradeoffs” (Petts, 2004: 116).

During the last years public participation processes have been used throughout Europe and to date there is a plethora of definitions, methods and approaches. For participatory processes appraisal methods have been developed to support deliberation of conflicting and hierarchical structures of values. The idea of citizens' participation in deliberative processes is based on Habermas' (1970, 1984) theory about communicative competence, which is the ability to use language to create understanding and agreement (Soma & Vatn, 2010). The idea of deliberative processes is hence to contribute to ensuring fair, democratic and legitimate decision making processes (O'Connor, 2000), where the citizens participation aims at unveiling a 'public opinion' and to devise policy recommendations based on a vision about a 'common good' (Pellizzoni, 2003). This view contrasts with what is termed interest group participation, which involves confronting different and specific positions to identify a compromise balancing the different opinions.

Participatory processes are demanded as means to deal with a rapidly changing world (see, e.g., Post and Lundin, 1996; UNEP, 2004). The most applied process in participation is the public hearing. It is, however, seen to suffer from several shortcomings. It is especially noted that the format used emphasizes individual interests and encourages strategic behaviour, and not the representation of social values (Soma & Vatn, 2010).

Moreover, while public hearings are suitable for processes, where a policy decision affects a local community and balancing of local versus regional interests is required, i.e. with large infrastructure projects where local impact is significant and therefore motivation to participate in decision making processes high. Participatory processes where local involvement is more removed, participatory processes suffer from a lack of general interest and motivation has to be generated through the possibility to influence policy making.

While participation was introduced to overcome limitations of technocratic decision making, it has thus become clear that participatory processes have to be adapted to the case requiring a decision. Importantly participatory methods can suffer from a lack of analytic aspects of decision making and strategic behaviour of participants. The term "analytic-deliberative" (A-D) was coined in the risk field to describe characterization processes able to reconcile "technocratic" and "citizen-centric" approaches (Stern and Fineberg, 1996). The analytic comprises "ways of building understanding by systematically applying specific theories and methods that have been developed within communities of expertise". A complex and modular

process termed deliberative mapping (DM) has been proposed (Burgess, 2007)), which could be used in WP3 as a means to test how suitable scenarios can be developed for bringing social values to bear on political decisions. DM draws on two prior methodologies: multi-criteria-mapping (MCM) developed by Stirling, Mayer and Eames, and stakeholder decision analysis (SDA) developed by Burgess and Clark.

Deliberative Mapping offers a practical means to inform technical policy decisions in a robust and accountable fashion. It shows that quantitative and qualitative appraisal techniques and individual and group-based methods can work together effectively as part of a deliberative and inclusive process. By balancing a variety of specialist, stakeholder and citizen perspectives, DM may help to foster more co-operative policy dialogues.

However, Deliberative Mapping is quite complex, time consuming and expensive. It needs strong project management and high quality facilitation. This places significant demands on sponsors, practitioners and participants alike. Such investments of time, effort and resources are not possible or appropriate in every context and should not be undertaken without deliberation.

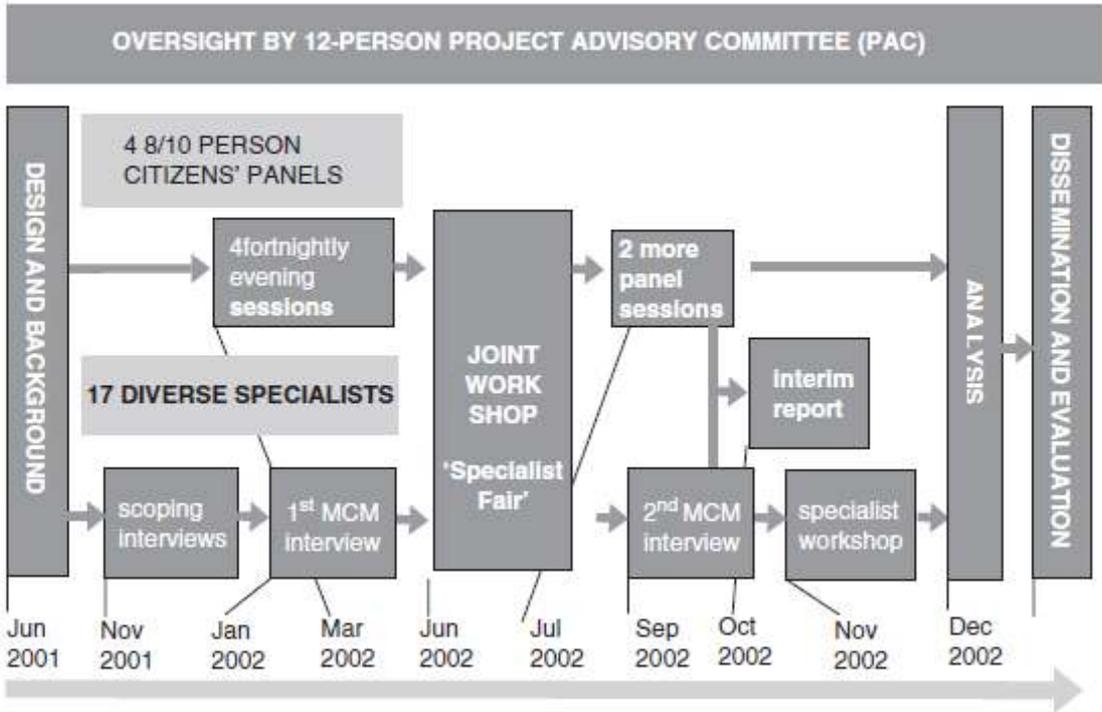


Figure 1. Summary of the structure and timeline of the Deliberative Mapping Project

## **Social Values**

In the literature two fundamentally different definitions for social values can be found.

Swaney (1987) insists to distinguish the sum of values held by individuals from the social values held by the wider group. Moreover, the values of an individual held in the role of a “citizen” or “consumer” might not only be distinct, but can be conflicting. Therefore appraisal methods have to be adapted not only to the type of governance decision, the case requiring a decision and available options, but also to the type of values intended to bring to bear on a decision. Framing an appraisal method appropriately is a key issue for success, as it directs subjects to consider the requested parameters, apply the available methods correctly (Soma, 2010). Moreover the relevant type of values determines the type of subjects, which need to be selected for an appraisal method.

It is therefore important for WP3 to define the social values to be used a priori, in particular whether social values are viewed as the sum of values held by individuals or stakeholders, i.e. actors with an interest in the subject (ie “scientists” in the case of dual use or “passengers” in the case of biometrics) or whether social values are defined as the set of values held by society as a whole, which could be defined as those values resulting in a “common good”. Methods have been devised for the appraisal of these values, however it is accepted that appropriate framing is required in order to obtain the appropriate responses.

## **Appraisal methods and decision making**

Decision making can be regarded as an outcome of mental processes (cognitive process) leading to the selection of a course of action among several alternatives. The output can be an action or an opinion of choice. It's important to differentiate between problem analysis and decision making: Problem analysis must be done first, which results in information that may be used towards decision making. The purpose of information is to throw light on a situation, helping the decision maker to choose a sensible action on the basis of more reliable estimates of the probabilities involved, and reducing the risk of making an expensive mistake. Although it is a straightforward matter of accounting to calculate the cost of a piece of information, the value of that information is subjective and dependent on the decision making situation. In a complex world decisions have to be taken, where two types of decisions have to be distinguished, those under certainty and uncertainty. While decisions under certainty require identifying a suitable course of action amongst several alternatives, where the various consequences have to be considered decisions under uncertainty usually require identifying an

appropriate course of action, where variable possible states of nature impact on the course of action differently. Risks and probabilities have to be considered along with the consequences.

**Main Elements involved in Decision Making:**

- (a) a number of possible actions,  $A_i$ , one of which has to be selected;
- (b) a number of events, or states of nature,  $S_j$ , any one of which may hold;
- (c) the value, payoff or consequence,  $C_{ij}$ , to the decision maker of taking any of the available actions, in the light of the possible states of nature;
- (d) the criterion by which the decision-maker judges between alternative actions.

		STATE OF NATURE					
		S1	S2	S3	S4	S5	S6
A C T I O N	A1	C11	C12	C13	C14	C15	C16
	A2	C21	C22	C23	C24	C25	C26
	A3	C31	C32	C33	C34	C35	C36

Payoff Matrix

Table 1: Example of a generic decision matrix under uncertainty, where different actions are assigned different values, depending on various states of nature.

The complexity of a decision appears to be inverse proportional to the complexity of the appraisal method. Clearly the framework of interdependencies and interrelationships between criteria have to be transparent, any uncertainty about their influence has to be resolved by removing the potential effect, thus reducing the complexity. The easiest appraisal methods therefore use linear rankings of criteria, while more complex tools allow a variety of mathematical formulas to govern the range of criteria and the interrelationship between them. However, it seems that Dual Use and Biometrics are complex phenomena, which require more simple appraisal and decision making tools. Clearly any complex decision making tool would require a separate step of appraisal to develop suitable parameters and their weightings, before in a second step subjects could be interviewed to obtain their views on the relevant issues.

### ***Pro-Con analysis***

PCA is a very simple, but instructive technique to gauge the impression of a panel or of individuals towards problems. While it guarantees transparent outcomes, the low level of complexity cannot exclude strategic behaviour. In this simple and subjective method the weighing of parameters remains with the user. There is no influence of the operator foreseen to introduce objective or generalised knowledge.

Process:

A simple 3 column table is created with headings: Option/Pro/ Con. In a variation sometimes a fourth column is introduced for additional parameters, which might not easily be introduced with Pro or Con, but still is relevant to keep in mind for the option, like secondary effects not directly of concern with the decision. All points should receive a score according to their importance, which can be added up to identify favoured options through overall scores.

<b>TREATMENT</b>	<b>PROS</b>	<b>CONS</b>
<b>Oxidation Ditch</b>	<ul style="list-style-type: none"> <li>• Small footprint (8 acres)</li> <li>• Energy usage - STEP 800,000 kWh/yr; Gravity 900,000 kWh/yr</li> </ul>	<ul style="list-style-type: none"> <li>• Higher capital costs than BIOLAC</li> </ul>
<b>BIOLAC</b>	<ul style="list-style-type: none"> <li>• Lower capital costs than Oxidation Ditch-</li> <li>• Small footprint (8-10 acres)</li> <li>• Lower energy usage with STEP (800,000 kWh/yr)</li> </ul>	<ul style="list-style-type: none"> <li>• Higher energy usage with Gravity collection (1.1M kWh/yr)</li> </ul>
<b>Ponds</b>	<ul style="list-style-type: none"> <li>• Lowest energy usage (600,000 kWh/yr)</li> <li>• Eliminates cost of solids treatment</li> <li>• Greatly reduces solids production and disposal (dredging required once every 20 years)</li> </ul>	<ul style="list-style-type: none"> <li>• Requires larger footprint (16-20 acres)</li> <li>• May require additional nitrification/denitrification treatment with STEP</li> <li>• Further investigation is required to determine if ponds release methane gas (more powerful greenhouse gas than CO<sub>2</sub>)</li> <li>• Greater construction impacts</li> </ul>
<b>MBR</b>	<ul style="list-style-type: none"> <li>• Requires smallest footprint (4 acres)</li> <li>• Higher quality of effluent, suitable for discharge at Broderson leach field</li> <li>• Enclosed facility controls odors</li> </ul>	<ul style="list-style-type: none"> <li>• Highest capital cost</li> <li>• Highest annual O&amp;M</li> <li>• Highest energy usage (1.3M kWh/yr. EIR indicated 2.1M and expected to increase with time)</li> <li>• High construction nuisance in center of town</li> </ul>

Table 2: Example of a PCA Table, where different actions are analysed for their Pro and Cons.

Summary: The method is very simple, cost efficient and versatile. Scoring is highly subjective and as there is no influence of the operators foreseen, panels might come up with incomplete sets of parameters. As the method is highly transparent, strategic behaviour by subjects is a major concern with this method.

### ***Maximin and Maximax Criteria***

Maximin and Maximax are often used for to decide between options, the outcome of which are under external control and therefore uncertain (ie investment strategies, strategic decisions). They are good to identify worst case and best case scenarios, but less suitable to identify solutions which in effect constitute a compromises balancing different interests.

Maximin/Maximax

	S1	S2	S3	S4
A1	100	120	100	100
A2	50	50	50	150
A3	60	80	110	110

Pessimistic: The maximin criterion suggests that the decision-maker should choose the alternative which maximises the minimum payoff he can get. This pessimistic approach implies that the decision-maker should prepare for the worst to happen. Select column with minimum and select choice with maximum - Choice: A1

Optimistic: The maximax criterion indicates that the decision-maker should, on the contrary, choose the alternative which maximises the maximum value of the outcome. This optimistic approach implies that the decision-maker should assume the best of all possible worlds (failure is not a catastrophe). Select column with maximum and select choice with maximum - Choice A2

Critic: Maximin and Maximax fail to consider probabilities or the readiness to accept risks, i.e. if 19/20 choices show a moderate positive outcome, one extreme outcome would be chosen irrespective of the fact that it might be very unlikely to occur.

Modifications:

Optimism/Pessimism (Hurwicz): introduces  $\lambda$  factor for “optimism”: multiply optimal choices with  $\lambda$  and minimal with  $(1-\lambda)$ : sum up to yield value for appropriate choice. Optimistic  $\lambda$  (0,7 toggles choice to A2, pessimistic (0,3) to A1

Hurwicz

$\lambda = 0,7 \quad 0,3$

	S1	S2	S3	S4
A1	100	120	100	100
A2	50	50	50	150
A3	60	80	110	110

$100*(1-\lambda)+120*\lambda$	=	114	106
$50*(1-\lambda)+150*\lambda$	=	120	80
$60*(1-\lambda)+110*\lambda$	=	95	75

The flaw with Hurwicz is the frequent overestimation of optimism by decision makers, i.e. the lack of preparation for an unwanted outcome.

Minimax Regret (Savage-Niehans): subtract each value from maximum of the relevant state, identify maxima of each choice and select relevant action for minimal regret – Decision A3

Savage-Niehans

	S1	S2	S3	S4
A1	0	0	10	50
A2	50	70	60	0
A3	40	40	0	40

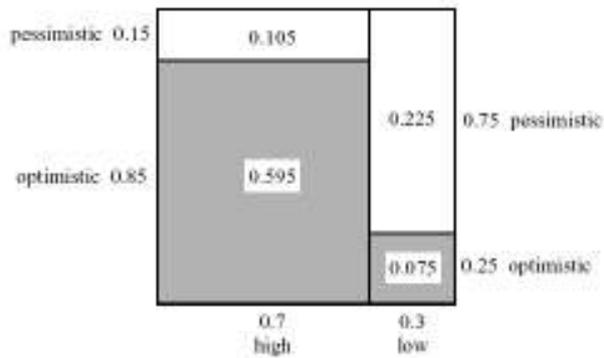
The flaw with the regret criterion is that the values of the regrets are not absolute. They are strictly relative to other alternatives and will vary as the number of system alternatives is expanded or contracted.

For example, if A2 would be irrelevant, it still influences the decision, as without A2 the decision would be different: A1

Savage-Niehans

	S1	S2	S3	S4
A1	0	0	10	10
A3	40	40	0	0

Probabilities: The previous examples dealt with each state occurring at identical probabilities, which in reality will not be the case. Therefore modifications include estimates for the probabilities of each state, to calculate risks more appropriately. The visualisation below depicts the probabilities of 2 choices, which are estimated to be of different likelihood (0,7/0,3). The area provides an instructive visualisation of the associated risks, as in this example below.



Summary: Maximin and Minimax are suitable to analyse scenarios for best solutions within specific constraints and options for action. For a value dialog much work would need to be invested in generating reliable values to insert into the tables. Maximin decisions are suitable to identify best solutions or prepare for worst case scenarios, however they are less suitable to identify solutions, which constitute the a compromise between differing opinions.

### Value Tree

Value Trees are useful for structuring various alternatives. They present are versatile elements to incorporate highly disparate attributes into a decision.

Value function  $v(x)$  can assign a number i.e. value to each attribute level  $x$  according to specific preferences.

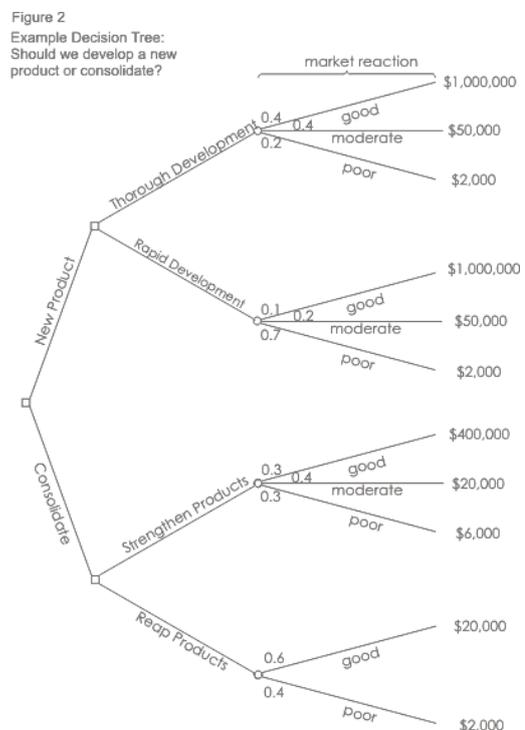
Value describes subjective desirability of the corresponding attribute level.

### The Phases of Value tree analysis

- Problem Structuring
- Defining the decision context
- Identifying objectives
- Identifying decision alternatives
- Hierarchical organisation of objectives
- Specifying attributes

### Preference elicitation

- Recommended decision
- Sensitivity analysis



Summary: Problem structuring requires a separate process, as attributes of concern, their parameters and weightings are essential for a successful implementation. Moreover the range of attributes can be rated according to different functions: direct, SMART, AHP etc will have significant impact on the tree and will certainly be too complicated for a panel to maintain an overview of complex effects. Therefore transparency with this method is limited, thus strategic behaviour becomes more difficult.

### ***Multi-attribute utility***

The purpose of using MAU in decision making is to create a mathematical model to aid the process. It gives the decision maker the ability to quantify the desirability of certain alternatives. Utility theory is useful when uncertainty and risk are considered. The end result is of using this method is a function which represents the deciders preferences, given a certain set of attributes.

Process:

To determine the utility value, or the desirability, of the design, there are six steps.

1. Identify significant design attributes and generate alternative designs
2. Verify relevant attribute conditions or bounds
3. Use the lottery (described below) to determine the designer's preference
4. Evaluate Single Attribute Utility (SAU) function and trade-off preferences
5. Combine SAUs into Multi-Attribute Utility function (MAU)
6. Select alternative with the highest MAU value by ranking the alternatives

Summary: Every attribute has to conform to the same specific unit, or need to be transferred into one. MAU is generally used for highly technical and/or design problems, where various physical models can be integrated.

### ***Multicriteria Mapping ( <http://www.multicriteriamapping.org/process/>)***

Multicriteria Mapping (MCM) was first proposed in 1997 (Stirling A. Multi-criteria mapping: mitigating the problems of environmental valuation. In: Foster J (ed.). Valuing Nature. Routledge: London, 1997.). It derives from the most prominent of a wide variety of decision support tools developed in the field of multicriteria assessment (Keeney, 1976; Von Winterfeldt, 1986; Stirling, 1997). As such, it is based on long-standing and firmly grounded principles and disciplines that have been explored and tested over many decades in this area.

Unlike most other comparable approaches – both in the field of decision analysis and more widely – MCM focuses more on 'opening up' than on 'closing down' a decision or policy process. Researchers gain a systematic picture of the precise ways in which different perspectives vary on the issues and options in question - as well as their practical implications for appraisal.

In common with other multicriteria approaches, MCM has four basic steps:

1. Develop a set of 'options'

These distinguish a number of alternative ways to achieve a particular aim. Although some options may be specified for the purposes of comparison, participants are also free to define their own options in any way they choose.

2. Characterise a range of 'criteria'

These represent any issues that are seen to be relevant in appraising the options. They can reflect aspects that can be 'traded off' against each other. They can also reflect issues of principle, which cannot be traded off. Each participant is free to include whatever criteria and define these as they wish.

3. 'Score' each option under each criterion

These numbers address the relatively technical business of assessing options under criteria. The scale is flexible, allowing easy reflection of different datasets. The higher the score, the better the performance. Crucially, MCM allows specification of minimum and maximum scores, so key uncertainties can be taken into account.

4. Assign a 'weight' to each criterion

These reflect different ways of prioritising criteria, depending on the context or viewpoint. The higher the weight, the higher the priority. Assigning weights takes into account the relative importance of the difference between best and worst performance under individual criteria.

One end product of these four steps is the calculation of an overall 'rank', expressing - for the viewpoint in question - the relative performance of each option under all the criteria taken together. Here, MCM follows the well-established linear additive weighting procedure, in which the rank simply represents the weighted sum of normalized scores. Participants are free to cycle through the four steps as much as necessary, to arrive at a final picture with which they are satisfied.

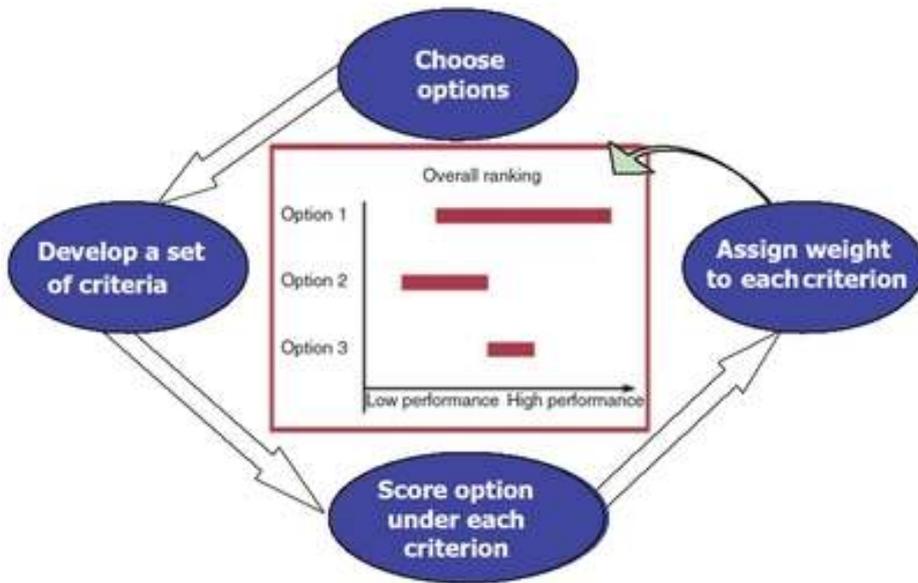


Table 3: The Process of MCM with the typical ranking outcome

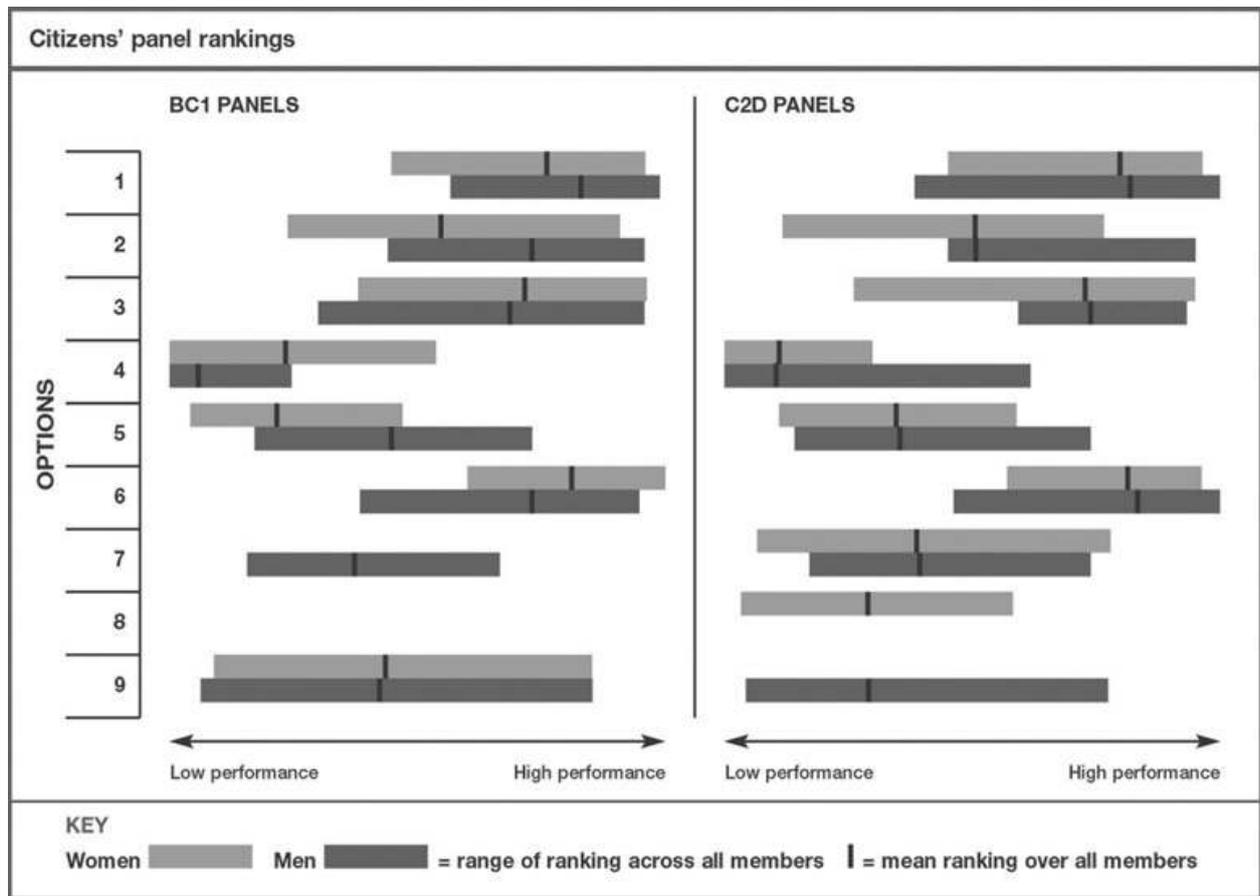


Table 4: Example of the ranking outcome of MCM from 2 different panels. The bars give the range of parameters associated with the options, the black bar the mean value.

Summary: MCM is versatile and has been successfully used for many different situations. It can provide comparable results from different panels and thus promotes the integration of

analytic deliberative processes. While it provides an overview, it deliberately fails to promote closure, subjects are not forced to decide between different actions, they remain as alternative options which are more or less favourable. Strategic behaviour can not be excluded, but as actions remain open strategic behaviour might not be of particular concern.

### **Participatory exercises:**

For an analysis of and decision on a participatory exercise as a second step of the value dialogue we reviewed the literature on instruments, methods and tools used in participation and decision-making. The aim of the second step is to let people draw up positive developments for the problem areas of dual-use and biometrics studied in WP 5. The participative exercise shall be designed with a view on its usability as qualitative supplement to value surveys in European governance of S&T.

For the evaluation of different mechanisms for public engagement it seems necessary to give a definition of the term participation. Generally spoken participation is the involvement of citizens or “the public” in decision-making processes of policy-setting bodies (Elliott et al., 2005; Rowe and Frewer, 2005). Within this broadly phrased delineation there is ample scope for interpretation. While taking part in elections, referenda, official opinion polls and petitions are seen as forms of participation by some others define it in a narrower way (Arnstein, 1969; Austrian Council of Ministers, 2008; European Institute for Public Participation, 2009; Rowe and Frewer, 2005). Graduations can be concentrated to three categories according to the level of involvement and the flow of information: Arbter et al. (2002) named them information, consultation and decision-influencing (Fig.1); Rowe and Frewer (2005) called them public communication, public consultation and public participation (Fig. 2). For this working paper we will stick to Arbter et al.’s nomenclature. At the information stage plans or decisions are made public to stakeholders and citizens, e.g. at public meetings, but there is no or only little opportunity to influence decisions. The communication flow is unidirectional from the decision maker or sponsor to the public. The aim of the second level - consultation – is to get insight on the public’s views and opinions, e.g. through focus groups or opinion polls. The information is passed to the sponsors of the initiative. At the third level of involvement the public obtains decision-influencing power, e.g. through citizens’ juries or consensus conferences. The flow of information is bidirectional and there is a certain degree of dialogue between the sponsors of the initiative and members of the public.

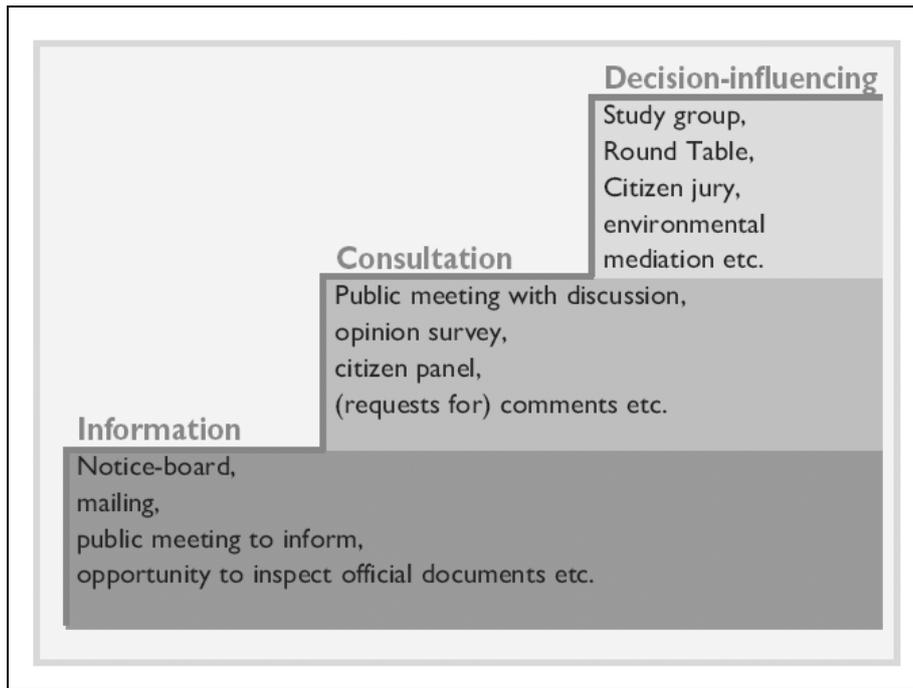


Fig. 1: Stages of public participation (Arbter et al., 2007)

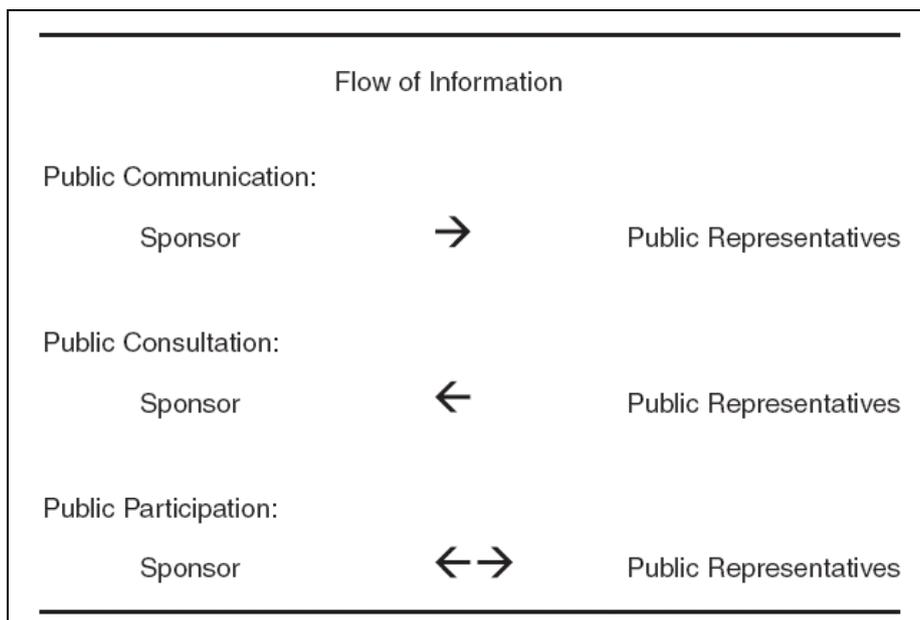


Fig. 2: Three types of public engagement (Rowe and Frewer, 2005)

Another term that needs clarification is “the public”. “The public” does not exist but has to be divided into subgroups. Hence, participation activities can also be distinguished by the people involved in the process: lay persons or experts, private persons, stakeholders, or representatives of interest groups.

Value isobars focuses on social values. Depending on the concept and definition of social values the participants or participating groups of the public have to be defined. According to Renn's (2006) suggestion and our understanding of participation in science and technology issues a participatory exercise should combine expertise on the particular topic as well as public values and preferences. Experts and non-experts on the particular topic shall therefore be involved in the process equally. To ensure the decision-influencing impact political representatives and representatives of decision-making bodies shall furthermore be directly included into the participatory process. If this is not possible the results shall at least be presented to and discussed with decision-makers or policy-makers.

Table 5 gives an overview on the methods that were reviewed for the value dialogue. We assessed the methods along the following criteria:

- Level of involvement: The selected method has to be suitable for involvement on the decision-influence level.
- Participants: The selected method should be suitable for the involvement of experts, lay people and representatives of decision-making units.
- Output: The selected method shall be output orientated in a way that policy-makers can continue to work with the results (e.g. written statements). The kind of output (consensus, tolerated consensus, compromise, etc.), however, is not the most important criterion for this assessment.
- Resources: The complexity of the method was considered in this assessment as highly complex methods were excluded due to the limited resources in the project. Complex methods which might be downsized or adapted to a pilot study, however, were not excluded.

We selected nine methods for further discussion. The other methods were estimated not to be suitable for the second step of the value dialogue. In the following section we will provide an overview of the methods to be considered.

### *Charrette*<sup>5</sup>

Charrette is an intensive face-to-face process designed to bring people from various sub-groups of society into consensus within a short period of time. It is adopted to develop action plans and is thus output orientated.

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<sup>5</sup> summarised from Elliot et al. (2005) and Lennertz et al. (2008)

There are three phases of a charrette: the pre-charrette, the charrette-workshop, and the post-charrette. During the pre-charrette a diverse group of citizens or stakeholders, representing a broad base of interests, is appointed as a steering committee. This steering committee is included in defining the issues and goals for the charrette-workshop. At the charrette-workshop the steering committee presents its interests and ideas to invited citizens. The invited citizens can further discuss the topics with the steering committee members in interview sessions. After these sessions every participant ‘votes’ for the most important issues. The charrette-team (steering committee and facilitators) reflects on the input of the public and analyses the results. According to the time budget interview-sessions and subgroup meetings might follow. The charrette-workshop can be planned from one to ideally four to seven days. At the end of the feedback cycles the charrette-team finalises the ideas and prepare (an) action plan(s). At the post-charrette the workshop results will be presented to the public and implementation might start.

### ***Consensus Conference***<sup>6</sup>

A consensus conference is a public enquiry in which a group of lay people pose questions to a panel of experts, assess the answers and write a (consensus) statement at the end of the conference. There are different models whether consensus is required or not. An ideal process comprises study sessions prior to the conference where the citizens’ panel discovers the topic and its significant issues (e.g. by drawing on experts and documents). At the public consensus conference the citizens’ panel poses key questions to an expert panel. After expert presentations and citizens’ cross-examination, the citizens’ panel composes a report which is publicly presented and disseminated to stakeholders, policy-makers, and other interested people.

### ***Scenario Building Exercises/Scenario Workshops***<sup>7</sup>

“Scenario methods are used in the construction of different possible models of the future” (Kosow and Gaßner, 2008). There are several phases of a scenario process: 1) identification of the scenario field, 2) identification of key factors, 3) analysis of key factors, 4) scenario generation, and 5) scenario transfer (if necessary) (Kosow and Gaßner, 2008). Normative-narrative scenario techniques can be used for participative approaches with a focus on constructive options and common vision building. Experts, representatives of civil society and policy-makers can be integrated likewise. There are several variants of scenario building

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<sup>6</sup> Summarised from Elliot et al. (2005)

<sup>7</sup> summarised from Elliot et al. (2008), Gnaiger and Schroffenegger (2008), and Kosow and Gaßner (2008)

exercises, e.g. group sessions within interest groups with a following plenary session, or building best-case and worst-case scenarios (Gnaiger and Schroffenegger, 2008). Factors along which scenarios will differ can be chosen, e.g. social values (Elliott et al., 2005). Scenarios are documented in written reports and are presented to the relevant publics.

### ***Neo-Socratic Dialogue***

“A NSD is an inquiry into ideas, originally meant to find consensus on some topic through a joint deliberation and weighing-up of arguments. The dialogue aims at visioning, explaining values and clarifying fundamental concepts” (Littig, 2003).

“A second aim of the NSD is to learn to have a dialogue instead of a discussion. This requires adequate command of a number of dialogical roles, skills and attitudes, especially suspending judgements and keeping a balance between taking position and resigning” (Littig, 2003).

In the neo-Socratic dialogue arguments are based on experiences of participants (Gronke, 2003). The focus lies on a single fundamental ethical question (e.g. Do animals have rights?).

The NSD follows the following procedure: Before the discourse commences a well formulated, general question is devised. The first step is to collect concrete examples experienced by participants in which the given question plays a key role. The group selects one example, which will usually be the basis of the analysis and argumentation throughout the dialogue. Crucial statements made by the participants are written down on a flip chart or board, so that all can have an overview and be clear about the sequence of the discourse (Littig, 2003).

Based on the concrete examples the focus question will be discussed and abstracted to a level of norms and principles. A Neo-Socratic dialogue is moderated by a trained facilitator who will also document the reasoning of the dialogue. In a follow-up session participants can reflect on their insights and identify approaches for implementation into governance.

### ***Round Table***

The Round Table does not have a predefined design. Basically, it is an open discussion round of a group of people. Participants might be stakeholders ([www.partizipation.at](http://www.partizipation.at), 3.3.2010) or also lay people (Felt et al., 2008). The discussions can be output orientated or not, it can be a single discussion or a series of Round Tables. Felt et al. (2008), for example, brought together fourteen laypeople and seven genome researchers to discuss the social and ethical aspects of genome research.

### ***Youth- and Students-Parliaments:***

Youth- and students parliaments are mainly part of the established local participation instruments that focus on decreasing juvenile disenchantment with politics, on building trust in political structures and institutions, and on generating interest in and educating about the political process. Different concepts of youth parliaments are quite numerous, basically it is possible to distinguish between representative, open and project-oriented forms of youth parliaments. Another source of distinction is the legal status of these youth parliaments, thus the amount of rights and powers that any particular youth-parliament possesses. (see Hafenecker/Niebling 2008: pp.123-124)

Also regarding the size of the parliament [10-100 persons], the periodicity and the length of caucus and the modus of delegate assignment the parliaments are quite variable.

What youth parliaments have generally in common is the democracy-theoretical background. Youth parliaments often have the model of the active citizen and of the importance of civil-societal participation. Thus their theoretical foundation is linked to political philosophers like Michael Walzer, Richard Rorty and Robert Putnam or Jürgen Habermas and Ralf Dahrendorf in the German context. The core of these concepts besides the ‘active citizenship’ is the cooperation between civil society and state in form of a symbiosis between governance and government for a common good. (ibid.: pp.126-127)

Youth- and student parliaments are not only an institution of political education – of playing democracy – it is a participation process that gives the youth the chance to influence decisions, to take responsibility for their immediate interests and to set the agenda regarding important topics and issues, e.g. by press conferences linked to the event.

Crucial for a successful youth parliament – successful in the sense that the youth accepts it as an interesting possibility of shaping their environment and of influencing decisions – is that the parliament work of the youth is accompanied by adults who provide the organizational support and who also provide pedagogic input if needed. Another key point is the notion of the youth parliament as a participation instrument that is committed to sustainability and is not stuck in formal mechanisms. (ibid.: p.130)

### **Methods of limited suitability**

Four methods are indicated as being of limited suitability for the second step of the value dialogue: Role Play, the fish bowl method, workshop, and the World Café.

### ***Role Play***<sup>8</sup>

During Role Play participants adopt designated roles and act out characters that have personalities, motivations, and backgrounds that are different from their own. This process might enhance understanding an issue from another perspective. It is described as a useful ice-breaker in participation processes where people gain some empathy for other stakeholders' position. As there is no output orientation it does not seem appropriate for the second step of the value dialogue as a solitary tool but might be connected with other methods.

The fish bowl method per se has no output orientation and therefore does not seem suitable; but might be integrated as a technique in another method or process. The definition of the term workshop is highly unspecific. Workshops are designed in different settings and highly depend on the facilitators intentions. We, therefore, do not take it into closer consideration. In a World Café people discuss a topic in a relaxed setting. It is a creative process spread over several sessions and promotes an exchange of knowledge and ideas ([www.partizipation.at](http://www.partizipation.at), 3.3.2010) but there is no clear output orientation. It might be integrated in a participatory design, though.

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<sup>8</sup> Summarised from Tomei et al. (2006)

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