THE PARTNERSHIPS RESOURCE CENTRE

Using Foresight with Partnerships

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Abstract

Most cross sector partnerships are created either because partners share a vision on a (negative) future or because they want work on a common vision to create a positive future. Both aspects are fundamentally different, but can be two sides of the same coin. Both approaches also base their analysis and legitimation on some form of foresight. Foresight techniques are introduced to better understand 'the future' by extrapolating (forecasting) the consequences of present strategies or trends, or by 'backcasting' from a desirable or feared future to the present. Foresight techniques contain prescriptive as well as descriptive elements. When used appropriately, foresight can help in particular in the appraisal or problem-definition phase of a partnership process. Foresight furthermore helps in specifying the input conditions of the partnership. In later phases foresight can be used as a monitoring and evaluation technique to check whether the partnership is actually contributing to effective solutions to the wicked and complex problems that partnerships are intended for. When used inappropriately, foresight functions as a fixed ideology – a belief system – in support of inflexibility and groupthink. The function of foresight, thus, changes throughout the partnering process. In later phases foresight can become part of attribution discussions which focuses on the impact and effectiveness of partnerships as part of learning loops. In this phase, the selection of specific foresight techniques also changes. The changing role of foresight in the actual practice of partnerships has hardly been realized. This paper discusses the concept and techniques of "foresight" and how it effectively can be used in the various phases of the partnering processes. First, the concept is introduced: what steps need to be taken in a foresight study, and why foresight should actually be executed. In particular the use of foresight in strategy formulation and sustainability is addressed. Secondly, the use of foresight in partnering processes is elaborated with an advice on how foresight could best be used along these phases. As an annex this paper provides short background information on the most relevant foresight methods.

Key words: M&E= Appraisal, Input and effectiveness; Foresight, Forecasting, Backcasting, Scenarios

''How could I go forward when I don't know which way we're facing? How could we go forward when we don't know which way to turn?''
John Lennon (1971) **(**quoted in Morgan, 2009:68)

1. Introduction

Is the future something that happens to us or something we can create? Szymborska portrays the future as something that is running us by (quoted in Tevis, 2010:887). Glenn (2008) argues that the future is more complex and changes more rapidly that we often think, whilst the factors causing these changes also change faster now. People have always felt the urge to discover (and manage) their future. Enter a lucrative and receptive market for oracles, fortune-tellers and self-proclaimed futurologists. The leading question in the scientific discourse has been more profound: what are the most important driver(s) of change?

In the nineteenth and twentieth century, science and technology were seen as the most important drivers of change (Cachia et al., 2007). Gradually, foresight scholars accepted that technological factors were not the only factors influencing the future. The second generation of foresight studies, therefore, shifted the emphasis towards seeing technological development "in relation to its contribution to and influence from markets" (Georghiou, 2001). Since the 1990s, policy makers increasingly and explicitly started to admit that technological development was strongly – and often decisively - influenced by political, psychological, societal, and cultural factors as well (Cachia et al., 2007). This third generation of foresight consequently included the social dimension of change and operationalized it the inputs and concerns of social actors (Georghiou, 2001) as the major drivers of change. No longer only scholars and the industry executed foresight studies, but civil stakeholders such as NGOs and consumer groups entered the foresight field. They focused for instance on issues like safety, health, and environment (Cachia et al., 2007).

General assumption amongst foresight scholars, is that the past can be used as a guideline for the future, since the future is related to the past. But, as McMaster (1996: 149) states: "as a predictor of the future, however, looking into the past ranges from the extremely dangerous to the merely useless when conditions are changing rapidly and adaptively." McMaster posits that what foresight scholars want to be able to do is to use the structures and processes of the present as a depiction of the future, and thereby see "the *shadow of the future"* (ibid.). The problem is that there is no one particular future waiting to happen. The actual future will be influenced by interpretations being made right now. An HLEG-Report (2002:14, quoted in Hanssen et al., 2009:1785) to the European Commission argued that "the future is not there to be predicted, but to be socially constructed".

Foresight as a technique represents fruitful tools in these construction processes, not necessarily in predicting the future. In this meaning, foresight techniques are very useful for partnering processes. In partnerships, a large number of stakes, tasks, responsibilities, authorities, and contingency factors, as well as differences in availability of information, knowledge, experience and interpretation are at hand. Awareness of these factors and differences therein, and alignment of partners is fruitful for optimal cooperation. Foresight techniques could greatly assist in this.

Foresight is increasingly used – often implicitly – in the legitimation of particular partnerships. Many cross-sector partnerships are initiated with either (1) a common threat or (2) a shared vision as mobilizing factor. The common threat – 'there will be major disaster if we don't act now' - has been the most pervasive basis for coalitions. But the common challenge or shared vision – 'we will lose out on major opportunities if we don't act now – is gaining in importance. The first approach represents a more tactical application of foresight techniques – it vitally depends on the identification of a common enemy. In this case it is relatively easy to create a sense of urgency with the participants, although it is more difficult to retain this sense of urgency over a longer period of time. The second approach requires a more strategic application of foresight techniques and largely depends on the identification of common opportunities. In this approach it is more difficult to create a sense of urgency, because a common enemy is lacking.

In search of the Common threat: Tactical use of Foresight

Intellectual partnerships like the 'Club of Rome' in 1972 were able to mobilize millions behind its prediction of an economic and ecological apocalypse. The message that there were 'limits to growth' raised long term awareness of world leaders and decision makers on the relationship between human economic development and vulnerability of the planet. The Club of Rome used a Future technique on the basis of a World3 computer simulation model that predicted an absolute shortage of resource to occur during the first half of the twenty-first century (Marxsen, 2008:325). Twelve scenarios were drafted that showed different patterns and environmental outcomes for world development (Meadows et al., 2004). Foresight was thus directly used as a tool to convince global leaders to take a longer term perspective. After the original doom-scenario did not materialize – not in the least because policy changes appeared, but also because of some flaws in the original data – the Club slowly modified its mission towards finding "new and practical ways of understanding global problems".

The example of the Club of Rome hints at one problem of foresight techniques: they can be used to mobilize partnerships, but they probably have to be adjusted in the follow-up phase in order to take changing circumstances (including the response of actors to the predictions) into account. Other 'clubs' and think-tanks that followed the lead of the Club of Rome, were also based on comparable doom scenarios. They had a particularly receptive audience in the 1970s and 1980s, but experienced considerable legitimacy problems lateron. More recently, however, the doom scenarios related to 'global warming' have gained appeal again. Again, a particular type of multi-stakeholder partnership was used in combination with a number of influential foresight exercises, as framed for instance by the Global Roundtable on Climate Change (GROCC) or the Intergovernmental Panel on Climate Change (IPCC). The GROCC and IPCC try to reach consensus on scientific, economic, and technological issues to shape effective public policies regarding climate change. All initiatives on climate change in particular use 'backcasting' techniques to first try to understand the nature of the ecological disaster, next raise awareness with people around the world, in order to stimulate societal groups to engage in action. Like in the case of the Club of Rome, critics have first and foremost attacked the validity of the predictions and the techniques used to come to these predictions. More than ever, however, other partnerships have been created to respond appropriately to the common threat. Noticeable example is in this respect the International Climate Change Partnership (ICCP), a global coalition of companies and trade associations from diverse industries. The ICCP is "committed to constructive and responsible participation in the international policy process concerning global climate change" (www.iccp.net, consulted January 2011).

In search of a Common Challenge: Strategic use of Foresight

The second type of a more optimist foresight approach is gaining importance, but perhaps in a less overt manner as in the case of climate change. Partly in response to the doom scenarios of the Club of Rome, other clubs of in particular (former) heads of state reiterated another of foresight. The club of Budapest, for instance, since 1993 became dedicated to a "new way of thinking and a new ethics that will help resolve the social, political, economic, and ecological challenges of the 21st century" (http://www.clubofbudapest.org). The 'club of Madrid' since 2001 tries to "respond to the demand for leader-to-leader support to confront today's global, regional and national democratic leadership challenges" (http://www.clubmadrid.org). The most important change since the beginning of the 21st century is, however, that many of the corporate partnerships also use the foresight technique in support of their partnership: by extrapolating present trends, they identify a number of (unwanted) futures, which in turn function as mobilizing factor for their partnership. Most of the time, the unwanted future functions as the framework for working on one type of solution (labeling for instance) which becomes the prime aim (and tool) of the partnership. Table 1 classifies some of the foresight oriented reasons on which major partnerships were founded.

Table 1 Exemplary Cross Sector Partnerships and their use of foresight

	Strategic/Active (positive)	**Tactical/reactive (doom)**
Marine Stewardship council (MSC)	The creation of the MSC in 1997 was a result of two global organizations, WWF and Unilever, wanting to tackle the issue of seafood sustainability.	No major criticism for the un-sustainability of present practices
Forest Stewardship Council (FSC)	No major ambition other than getting the FSC label accepted.	"In the days leading up to and following the 1992 Earth Summit in Rio, world attention was focused on the challenges faced by cultures around the globe as demands on their natural resources increased. Poverty, disease, land use change, climate change, and pollution all continue to threaten our resources and the stability of cultures worldwide. The challenges at Rio remain largely unmet. However, the conversations that occurred there contributed to one solution — the Forest Stewardship Council (FSC)."
Roundtable of sustainable palm oil (RSPO)	No major ambition other than getting the RSPO label accepted	"In response to the urgent and pressing global call for sustainably produced palm oil, the Roundtable on Sustainable Palm Oil (RSPO) was formed in 2004 with the objective promoting the growth and use of sustainable oil palm products through credible global standards and engagement of stakeholders."
Roundtable of Responsible Soy (RTRS)	Initiated in 2006, "The Round Table on Responsible Soy (RTRS) is the global platform composed of the main soy value chain stakeholders with the common objective of promoting the responsible soy production through collaboration, dialogue and consensus finding among the involved sectors in order to foster a economical, social and environmental sustainability."	

Sources: Organization websites (consulted in January 2011)

One of the most interesting examples of a strategic foresight reasoning provides the Dutch Initiative on Sustainable Trade (IDH). IDH is the best endowed cross sector partnership in the Netherlands at the moment. It became institutionalized in 2007 and organizes more than ten global value chains to become sustainable. IDH's stated objective is to be a multi-stakeholder platform for commodity market transformation, aimed at combating poverty and promoting a sustainable environment and fair trade. Present trends in commodity markets offer a challenge and an opportunity for global welfare. IDH identified a growing demand for more sustainable value chains. IDH framed the challenge of global commodity chains as a downward spiral based on the mutually reinforcing influence of three negative loops (IDH Monitoring Protocol 2010-2015, 2009:7) (Figure 1):

1. *Low prices, low margins*: commodity markets are in a price-driven race to the bottom, as most commodities are non-differentiated bulk products with low margins.
2. *Lack of regulation and support:* in many producing countries, governments fail to implement effective public regulation, and support systems, leading to low levels of development, productivity, and quality.
3. *Limited finance and investment*: the low margins in commodity markets imply high risks for financers, resulting in limited access to finance and low levels of investment.

Figure 1 – IDH Foresight: Negative spiral dynamics in the commodity sectors

Source: IDH Monitoring Protocol 2010-2015 (2009:8), copyright: NewForesight™

This figure was developed by NewForesight and refined in co-creation with IDH. It identifies the nature of 'failure' at three sides of the economy and thus argues for cross-sectoral involvement to address the issue. Ineffective governments and lack of civil society support lead to ineffective economic, social, and environmental policies and thereby to unsustainable commodity chains. No willingness to invest and no market demand or information asymmetry contribute to market failure. Elsewhere we have argued that awareness of the various dimensions of 'failure' is a important component of the correct motivation of cross sector partnering (cf. Kolk, Van Tulder, Kostwinder, 2008; Van Tulder, 2010). IDH foresight approach thus acknowledges that the problem comes from three sectors, which therefore require partners from all three sectors. IDH actually brought together all these partners, but in case it will lose constituency in one of these sectors (either in the North or the Soutch) will face serious legimation and consequentially serious implementation problems. The practical approach of IDH is that market transformation is needed to reverse the downward spiral: a systemic approach that resolves barriers for change by implementing drivers and incentives that shift the conditions under which commodities are produced and traded. The approach of IDH is a typical representative of the *strategic use* of foresight reasoning.

"A problem well stated (and shared by those concerned) is already half solved."
(Godet, 2006)

2. Foresight in general

Futures studies are the forward-looking equivalent of historical studies. If historical studies are concerned with origins, a futures study concentrates on goals, purposes, where to go, how to get there, and the problems and opportunities encountered on the way (Foresight International).

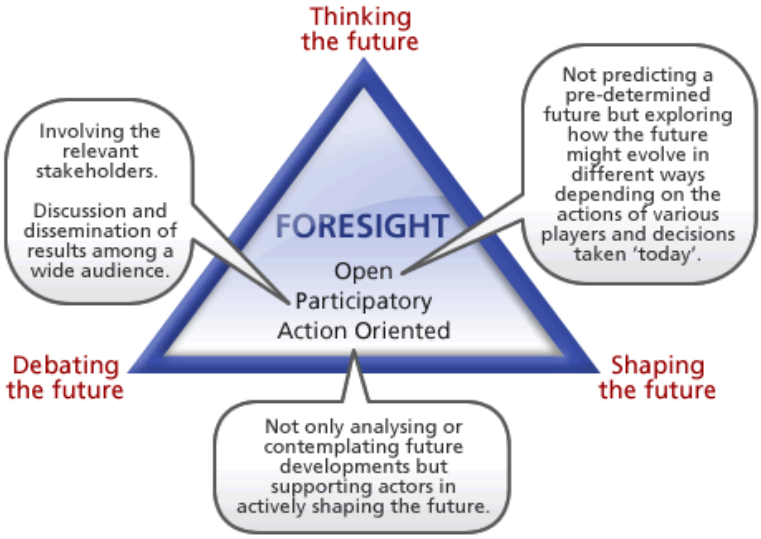
Three different types of future studies have been identified: modeling, forecasting, and foresight.[1] Modeling is the attempt to reproduce real-world relationships within a mathematical or computer model (FOR-LEARN). Forecast could be considered as the ancestor of foresight and is more an estimation about the future taken together with a degree of confidence (Godet, 2006). Forecasting assumes a high degree of stability and continuity, cq. business-as-usual, and therefore leads to one surprise-free future (Van Asselt et al., 2010). Foresight distinguishes itself from the other two futures studies in four characteristics (ibid.):

1. **Action-oriented**: Foresight is not only about analyzing future developments, but about supporting actors to actively shape them. Purely analytical studies of possible futures without possible actions are not considered as foresight.
2. **Open to alternative futures**: Foresight believes that the future is not pre-determined. The future could progress in different directions, which could be partly shaped by actions and decisions.
3. **Participatory**: Foresight involves a number of different groups of stakeholders. The results of the foresight exercise are spread to a large audience whose feedback is sought.
4. **Multidisciplinary**: Foresight is based on the principle that problems cannot be understood correctly if reduced to one dimension and one academic discipline. Instead, the image is captured in its totality with all the variables influencing it.

The ideas behind foresight can be portrayed as a triangle (Figure 2).

[1] Some authors (cf. Van Asselt et al., 2010) also include a normative dimension to future studies. The normative dimension takes into account social and normative insecurities besides cognitive insecurities. However, as normative future exploration has the same four distinguishing characteristics as foresight, it can be considered to falls under the foresight category.

Figure 2 The Foresight Triangle



Source: EU Commission Foresight; FOREN,http://forera.jrc.ec.europa.eu/index.html

A foresight exercise is usually launched when a certain system finds itself facing a specific challenge (EFMN). Common reasons for initiating a foresight study are preparing for long-term decisions (e.g. strategic decision, planning funding or public spending like infrastructure, setting priorities) or coping with challenges (e.g. transition in an economic or political system, changes in the environment or demography, improving competitiveness) (FOR-LEARN).

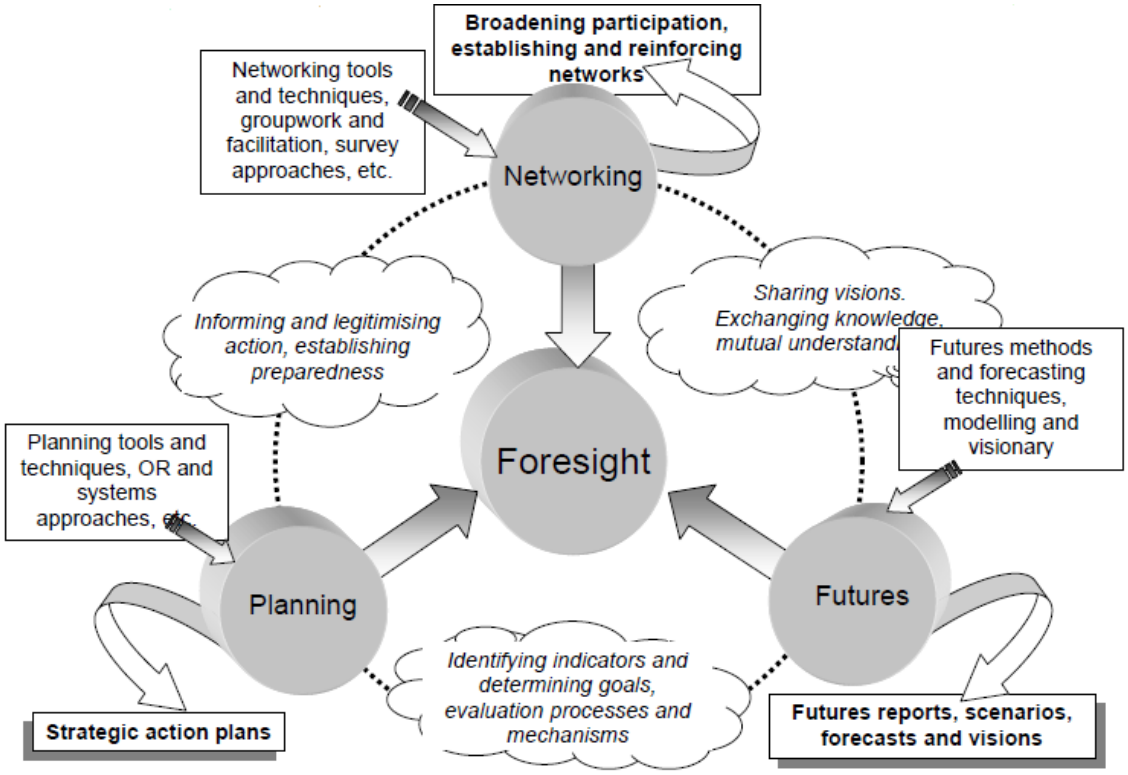
According to Hines (2006), the goal of strategic foresight is to make better, more-informed decisions in the present. A commonly used definition refers to foresight as *a participative process in which shared long-term visions are created to provide input to short and long term decision making. It mobilizes stakeholders and creates broadly based support for strategic decisions and public policy, making them more sustainable* (adapted from: EFMN).

Hanssen et al. (2009) consider foresight a technique in which information on current trends and future developments are combined with actor-based information and attitudes, which is obtained through participatory measures. The overall goal of foresight is not predicting the future, which could be considered unachievable in most cases. Instead, it aims to open minds to alternative possibilities for the future, thereby contributing to shape it in the desirable direction (Cachia et al., 2007).

A foresight study normally results in both tangible and intangible outcomes (Figure 3). Tangible outcomes are documents and the result of a systematic process of reasoning. They mostly include recommendations and could be widely disseminated (FOR-LEARN). Intangible outcomes emerge over the course of the foresight process and cannot be formalized. Examples are networking, consensus or common understanding, and changed attitudes and mind sets (ibid.). Hanssen et al. (2009) claim that the primary benefit of foresight studies does not lie in certain predictions, but in the process itself.

Therefore, the rationale for foresight activities is two-sided (ibid.): (1) prediction is combined with developing common visions and shared goals and (2) integration and development of networks are equally important as the end product of the foresight. After reaching a consensus, action is very probably faster since all actors are already looking in the same direction.

Figure 3 The Triple Base Foresight



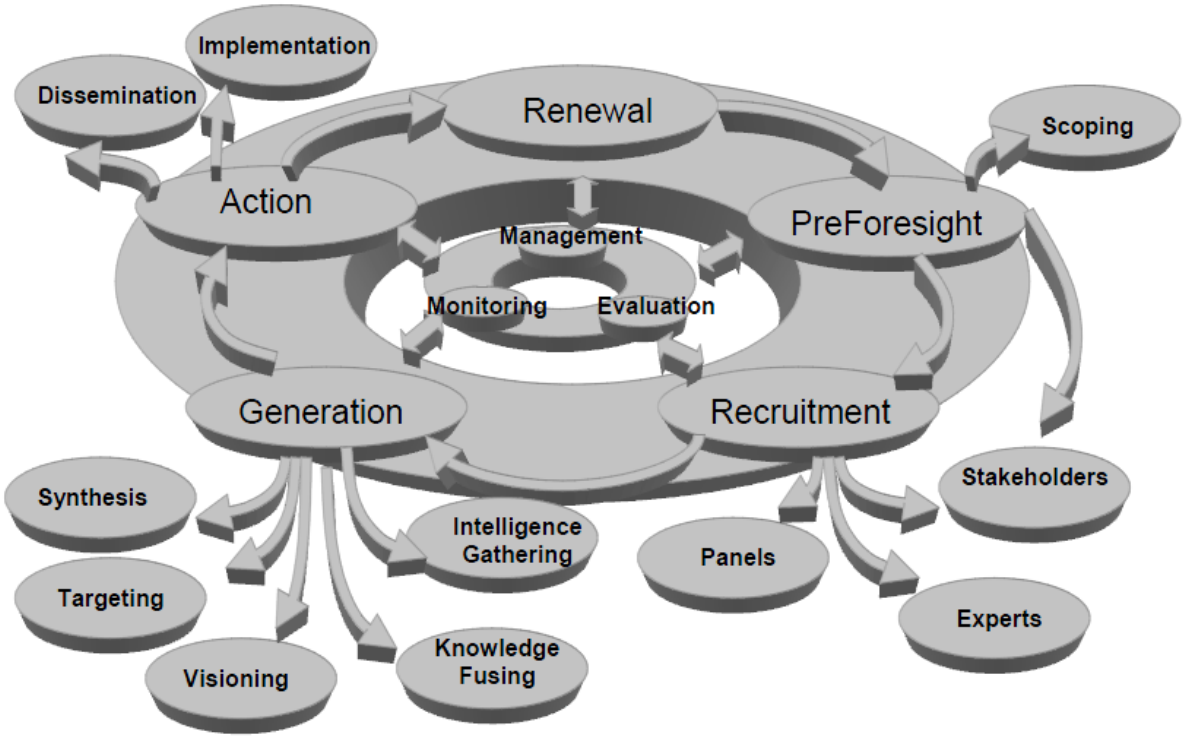
Source: Miles (2002:6)

The Foresight Cycle

A foresight study could combine various foresight methods and consists of various phases. Ian Miles (2002), one of the leading thinkers in foresight, uses a 'foresight cycle' that consists of five phases (Figure 4):

1. Pre-foresight (scoping)
2. Recruitment (participation)
3. Generation
4. Action
5. Evaluation and renewal

Figure 4 The foresight cycle



Source: Miles (2002:8)

Nugroho and Saritas (2009) and Popper (2008) provided a concise elaboration of these phases:

- **Pre-foresight (scoping):** The main decisions taken on the size and shape of the study are made. The aim is to meet the requirements and objectives of the foresight study with an appropriate methodological design. This pre-foresight phase may involve certain foresight methods. For example, a literature study could be necessary to identify the right objectives.
- **Recruitment (participation):** The participants are identified and recruited. The participants involve stakeholders and experts. It is important that people are recruitment from the start, since their input is valuable in all stages.
- **Generation**: The actual foresight takes place. Information and knowledge is gathered and synthesized, new knowledge is created, visions are set, and strategies are formulated. The generation phase has two types of outcomes: process oriented and product oriented (earlier referred to as tangible and intangible outcomes). The generation phase consists of three stages: exploration (understanding main issues, trends, and drivers), analysis (understanding the relationship between these and the context and synthesizing this knowledge), and anticipation (predicting possible futures or suggesting desirable ones).
- **Action**: The overall intention of foresight is to provide valuable inputs for strategy and policy making. Action plans should be formulated to initiate change processes to reach the desirable future. Therefore, the action phase might involve prioritization, decision making, and change.
- **Evaluation and renewal**: Evaluation could take place in three areas: (1) the appropriateness of the original objectives and their formulation and communication, (2) the organizational structure and methodology, and (3) the barriers to foresight and

how these could be tackled. These lessons are the input for the renewal phase, which aims at creating a foresight culture, where foresight is continuously improved and used as a strategy and policy making tool.

The foresight process does not stop after the evaluation and renewal phase. Instead, the renewal phase gives new input to restart a foresight study. Moreover, every phase contains feedback loops and one could also go back and forth between the phases. This makes foresight an iterative process.

Objectives and outcome of Foresight

According to Nelson (2010), the context is a crucial factor in correctly applying foresight techniques. The requirements for survival are set by the emerging context of the system. He bases this on a number of observations, amongst others (1) the context is always changing, (2) adaptation is required to sustain, and (3) the adaptive capacity of a system is critical. In order for a system to stay viable, it must develop "deep and integrated understandings of the content, drivers, and dynamics of the long evolution and transformation" of the system (Nelson, 2007, quoted in Nelson, 2010:288).

The goal of foresight is not to predict what will happen, as you might never know exactly what will happen, but to engage with whatever might happen (Cuhls, 2008, in Graefe et al., 2010). Future oriented thinking is essential for planning or policy action to be able to meet future challenges proactively. Foresight enhances this by collecting anticipatory intelligence from a large scope of knowledge sources and linking it to today's decision making (FOR-LEARN). These objectives include (FOR-LEARN; Hanssen et al., 2009):

- **Informing policy-making** so that decision makers are better aware of longer term developments and how these could or will interact with current policy decisions.
- **Building networks** that bring together people involved with shaping the future of a specific topic. The purpose of this is for them to collectively become better able to understand the challenges they face and opportunities they have.
- **Developing capabilities** throughout a region, sector, or organization and develop a foresight culture. The aim is that people will become able to initiate their own foresight activities and create their own foresight networks.
- **Building strategic visions** and creating a shared sense of commitment to these visions.

An important part of the tangible outcomes of foresight is therefore related to formulating a strategy that will achieve the desirable future. According to Godet (2006:8), "strategy calls upon [foresight] to clarify choices made with the future in mind". The underlying principle is to detect weak signals of change that are likely to influence the future of a system and its environment (Liebl and Schwarz, 2010). Foresight studies should not be considered as an end in themselves but as means of fostering strategic decision making. Their results should be communicated to relevant stakeholders in order to guide their actions (Godet, 1987, quoted in Gómez-Limón et al., 2009). Conway (2006) depicts the process of strategy formulation in a sequential mode and the role of foresight as an input for strategic thinking (Figure 5).

Figure 5 Strategy formulation

(Source: Conway, 2006)

Conway's representation of foresight as part of linear strategic thinking, gets increasingly criticised. Foresight proofs useful in the strategic decision making and strategic planning phase as well and thus can become part of an iterative strategy formulation and implementation process. A systemic and iterative foresight approach keeps actors involved and committed. Foresight as a process oriented technique, can improve the impact of decision-making as foresight helps creating a commitment among actors to support future oriented visions and encourages stakeholders to join forces to achieve common goals rather than compete (FOR-LEARN).

Three questions need to be answered to be able to develop a suitable strategy: (1) are we aware of the different ways in which our environment and our market might evolve over the next years, (2) do we know which factors or drivers of change are most likely to dominate how our industry will evolve, and (3) do we know what our strategic and organizational responses would be if a future were to unfold that was distinctly different from the one anticipated by our current plan (ibid.).

Continuous use of foresight is supposed to stimulate a *foresight culture*, improving the review phase of strategy formulation. According to Waehrens and Riis (2010), foresight presents issues not as problems related to seeing or identifying, but rather as problems of enactment. Tevis (2010:848) provides some smart reasoning regarding enactment:

> "Interestingly, the very assumption that we could plan to react to the future, assumes that we have the power to adapt or change based on those plans. If we have the power to enact change, cannot we also assume that we have the power to enact what we want in the first place? Why must we wait for something to happen to us, before we could take action? At the very least, an enactment based focus forces one to consider action over reaction."

Strategy formulation and policy making needs the input of knowledge from stakeholders to make more well-informed decisions and to adequately respond to shifting challenges. Foresight is useful in this in that is converts tacit individual knowledge to explicit group knowledge (Hanssen et al., 2009). At the same time, the decision making procedures could become more transparent when outcomes of foresight studies are made public and more people are involved in the foresight exercises. This results in measures that fit the context and opportunities (Koschatzky, 2005).

Sustainability

Foresight and sustainability questions are closely related – almost by definition. Because sustainability is not yet achieved (whether economic, ecological or social), all areas of sustainability require a considerable degree of foresight, especially in the action phase. Transition/transformation management receives considerable input from future insights – in fact it often builds upon long-wave reasoning which includes an assessment of long-term trends in technological, economic, social and political change (Cf. Rotmans et al, 2010). According to Floyd and Zubevick (2010:60), "sustainability thinking involves negotiating the boundaries around what is both possible and preferable". A focus in foresight directed to an assessment of what human activity results in what kind of worthiness and potential consequences in terms of economic, environmental, and social categories of limits is essential in sustainability thinking (ibid.). Solving the complex or wicked problems of today, require non-paradigmatic or 'out-of-the box'thinking. In the words of Albert Einstein: "The significant problems we have cannot be solved at the same level of thinking with which we created them".

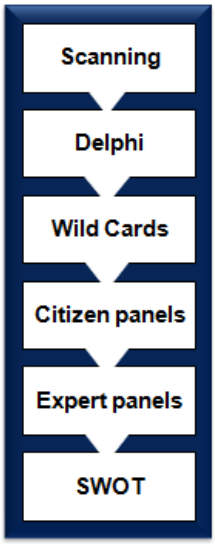
The integral sustainability approach helps to better understand what a particular perspective deals with and brings along. Lombardo (2006) calls this 'future consciousness'. He proposes several ways to develop this future consciousness (ibid.):

- challenge existing habitual beliefs about the future;
- brainstorm on alternative visions and beliefs about the future;
- become familiar with many diverse visions of the future, from both sciences and humanities;
- challenge existing habitual beliefs about your ability to influence the future;
- clarify and assess life plans and goals and critically consider alternative possibilities;
- learn about history and especially long-term trends that are continuing in the present;
- learn to better tolerate, if not appreciate, the uncertainties of life;
- learn the psychological practices and techniques for enhancing optimism; and
- learn the psychological practices and techniques for enhancing thinking skills, visualization, imagination, and creativity.

Future consciousness enhances the ability of mutual understanding and with that, the opportunity to collectively create visions of shared futures that serve the interests of all (ibid.).

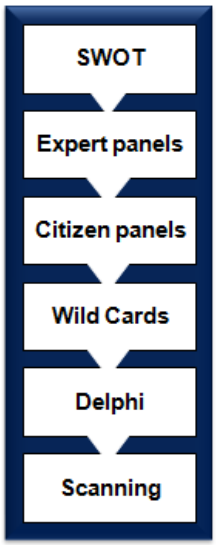
Sequencing

Choosing a particular foresight method remains a difficult part of the foresight exercise. Every foresight study is different in its objectives, context, resources, and thus is hardly appropriate for all situations. Scholars emphasize that there is substantial evidence that demonstrates that combining foresight methods improves the foresight accuracy (Clemens, 2004). Most foresight studies, therefore, combine various foresight methods in order to compensate for any deficiencies in single techniques. The Annex elaborates the basic characteristics of the most common techniques. In practice, scholars rather talk about foresight sequences. In this, the foresight exercise contains a series of foresight methods, all with a different objective, combined aimed at delivering the most optimal end result. Five types of sequences are most commonly used (no.1-4 are based on Keenan (2006) and on Z_punkt's Corporate Foresight Toolbox). Sequence no.5 is introduced by Voβ et al. (2005), who focuses more on the long-term viability and sustainability of systems.



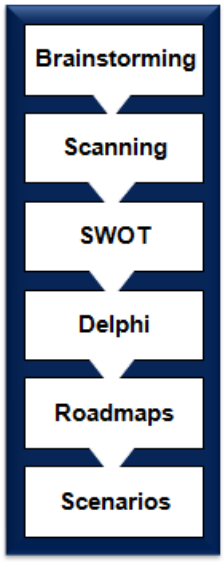
Sequence No. 1

Scanning: detailed analysis of main issues around a particular sector/theme of study.
Delphi: large-scale exploratory study assessing the likeliness of occurrence and possible impacts of main issues highlighted by the scanning activity.
Wild-cards: workshop-type activity aimed at the identification of possible events which may challenge the occurrence of 'highly probable' situations.
Citizen Panels: conference-type activity aimed to identify major public concerns on critical issues.
Expert panels: reduced group of key stakeholders looking at future implications of main findings.
SWOT: internal activity (possibly desk-work) aimed at synthesising outcomes in terms of current strengths and weaknesses as well as future opportunities and threats.



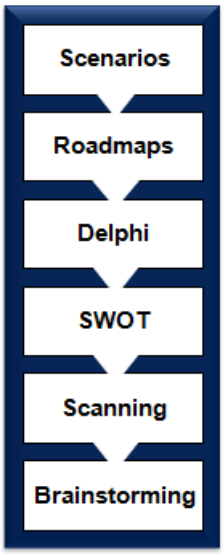
Sequence No. 2

SWOT: large-scale activity (e.g. workshop) aimed at the identification of strengths, weaknesses, opportunities and threats related to a system.
Expert panels: groups of experts looking at future implications of SWOT findings and clustering main issues into broader dimensions, such as social, technological, economic, etc.
Citizen Panels: regional task forces contextualising main issues and evaluating public acceptance.
Wild-cards: internal activity aimed at the identification of disruptive events and situations.
Delphi: large-scale normative study aimed at the formulation of policy recommendations.
Scanning: internal activity aimed to identify the success or failure of similar policy recommendations being implemented in comparable contexts, and better informing decision-making.



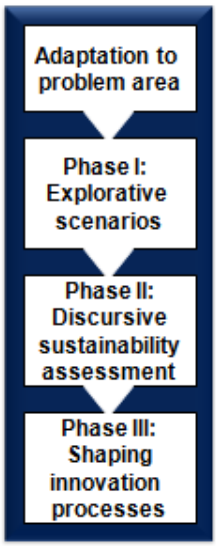
Sequence No. 3

Brainstorming: large-scale activity aimed to identify key issues around particular dimensions (e.g. social, technological, economic, environmental, political, sustainable).
Scanning: a desk-research activity aimed to describe and expand the most relevant ideas emerging from the brainstorm exercise.
SWOT: a workshop with about 20 experts from each of the following sectors (public, private and academic).
Delphi: an exercise targeting a selected group of experts assessing the stage of development of particular technologies.
Roadmaps: a panel-based activity looking at market needs and potential linkages between products and technologies.
Scenarios: same panel elaborating a vision of a desirable and feasible aspirational future.



Sequence No. 4

Scenarios: 1 business as usual, 1 negative, and 1 positive scenario (desk-research or genius forecast).
Roadmaps: 3 workshops with targeted experts preparing time-line and discussing market needs for each scenario.
Delphi: a large-scale activity aiming to identify STEEP impacts of suggested 'action plans' resulting from the roadmapping activities.
SWOT: internal activity looking at the strengths, weaknesses, opportunities, and threats of suggested 'action plans'.
Scanning: a parallel process mapping the market penetration of products and services connected to technological developments characterising initial scenarios.
Brainstorming: structured workshops with key stakeholders willing to identify new cooperation and collaboration instruments and exploit existing ones.



Sequence No. 5

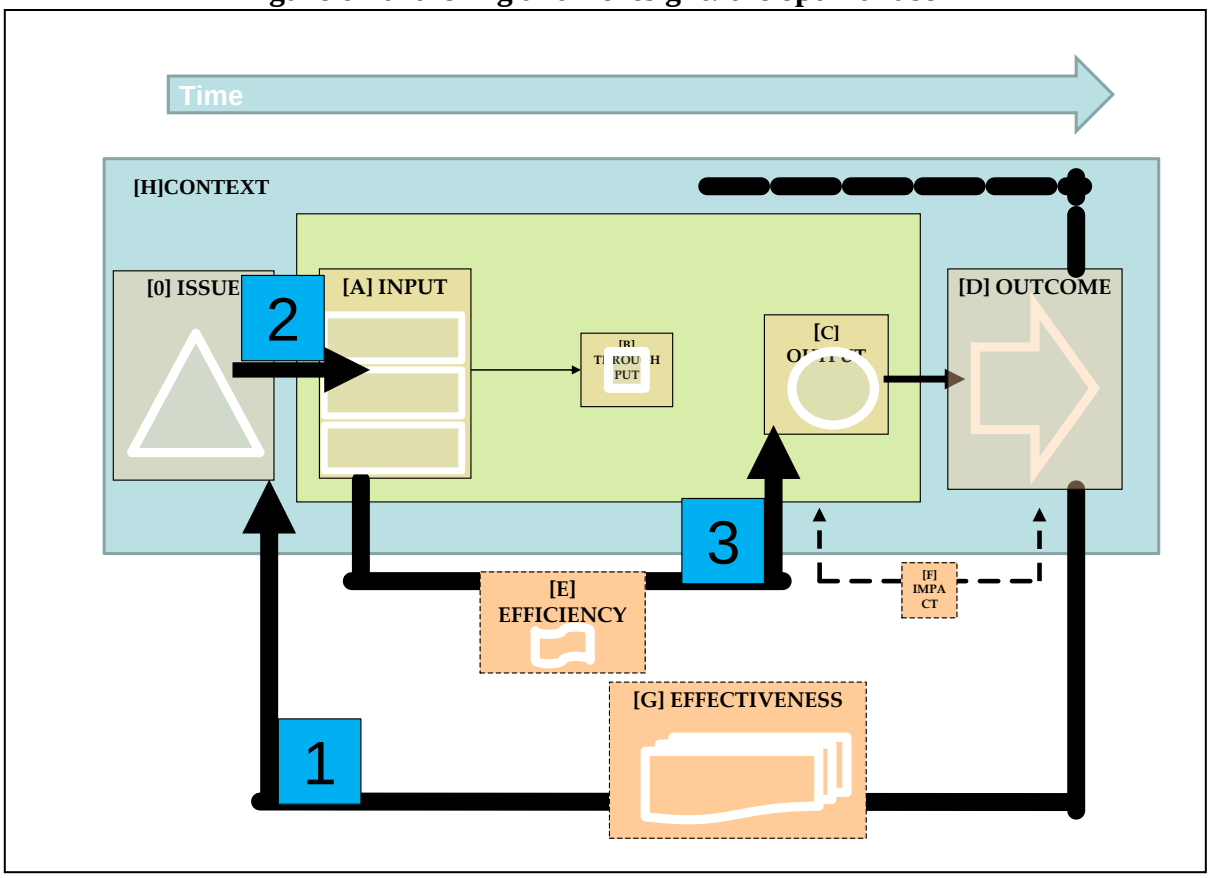
Phase 0: Scanning of future discourse: specific expectations and broader visions of actors. Development of conceptual framework of the transformation process.
Phase I: Collection of factors which influence transformation. Selection by uncertainty and impact, elaboration of alternative projections for selected factors. Construction of scenarios as resulting from the mutual influence between factor projections, composition of narrative storylines for selected scenarios.
Phase II: Elicitation of criteria for sustainability assessment held by stakeholders. Development of impact profile of scenarios with respect to identified criteria. Discursive assessment of risks and opportunities connected to scenarios.
Phase III: Identification of critical innovation processes (contingent across scenarios and high sustainability impact). In-depth analyses of actor networks and context conditions of critical innovations, identification of 'loci of influence'. Development of integrated strategy for shaping interdependent institutional, cultural and technological innovation.

It is not possible to define any 'optimal' foresight sequence. Every sequence has its own advantages and disadvantages. It depends on the objectives, context, and resources of the study what sequence of foresight techniques to use. Researchers are advised, however, to be aware of the reflective cycle of proper research (Van Tulder, 2007). It is tempting to start with a preferred conclusion (design) and then reason backwards. This is particularly the case with sequence no.4 that it starts with formulating scenarios and then reasons backwards how these scenarios could be achieved. The other presented sequences are more in line with the reflective cycle of research. The pre-foresight (scoping) phase of foresight is crucial in this process. Both types of partnership sometimes suffer from the deductive reasoning of sequence no.4. Prescription (and ideology) thereby prevail over description. For adequate partnering processes, in particular this technique therefore does not seem to be the most appropriate.

3. Foresight in the Partnering process

Figure 6 positions the major functions of Foresight along the Partnership Evaluation Model of the PrCs. The model contains all necessary/relevant phases to reach the intended outcomes: from appraisel (need-assessment) via input, throughput to output and outcome. Two important feedback and learning loops are identified: efficiency (on the cost-benefit ratio of the actual partnership) and effectiveness (on the value added and impact of the partnership). The size of the boxes and arrows indicates the relative importance of foresight in these various phases of the partnering process.

Figure 6 Partnering and Foresight: the optimal use



Foresight can have a function in three learning or translation loops in this process:

[1] As **initiator**: as an elaboration of a shared vision and/or shared threat (outcome and context) which become arguments in the appraisal of the problem, and in favor of the initiation of a particular partnership;

[2] As **guideline and operationalization**: foresight should help to formulate the exact goals (output) of the partnership and operationalize the concrete manner through which this output is expected to contribute to either solving the common threat or work on a common outcome;

[3] As **evaluation tool** in an iterative process: as feedback technique to check whether the output goals need to be redrafted for instance because the future has changed.

Three possible Scenarios for the use of Foresight in partnership processes

Partnering is far from a planning and implementation process. Rather it can be portrayed as an iterative process in which the various sequences can be followed in sometimes reversed order. Feedback loops provide important learning and adjustment roles. Foresight techniques – when used appropriately - can play an valuable role along in the feedback loops along three scenarios. First and probably most foremost, is the use of foresight in the appraisal phase of a project. The partnership is not yet established. Foresight assists in the correct formation of a particular partnership [1+2]. The second role of foresight can be in support of enhanced efficiency. The partnership has already been established, but the output is in jeaopardy [3]. The third role of foresight is in enhancing the effectiveness of the partnership. The partnership has already been established, but what to do in case the partnership contributes less to the outcome than intended [1+3]? Each scenario requires a different selection of foresight approaches related to different sequencing decisions.

➔ **Scenario 1: Partnership not yet established**

The initial phase of partnering processes poses three challenges: (1) to find out the motives of the partners and to align them, (2) to scope the partnership, and (3) actually setting a direction for the partnership.

To find out what motives partners have to join the partnership and what objectives they have for the partnership, stakeholder analysis and interviews could be executed. Benchmarking, literature review, trend extrapolation, and environmental scanning could provide information to define the playing field and to set boundaries for the programs. Brainstorming and wild cards are useful techniques to determine the possibilities of the partnership. Expert panels could provide more in-depth input for this. Once the partners are somewhat aligned in their vision, it is important to identify individual and subsequently mutual benefits for the partners. A stakeholder analysis could assist in this. To actually define a direction and steps to get there, foresight techniques like backcasting, roadmapping, simulation gaming, and relevance trees are useful. They, all in a different way, identify what steps need to be taken, what challenges and barriers could be expected, and what solutions could be brought up to overcome them. Backcasting and roadmapping also include setting milestones and time frames, enhancing time management. A cross-impact analysis could identify external factors and their possible influences and a Delphi study could then discover what the expected probabilities of these events are. Finally, a SWOT analysis could identify strengths and weaknesses of the proposed objectives and processes to get there. Foresight could hereby function as a guideline for the partnership; with an envisioned future in might, the road towards that future could be determined.

It is important to create a foresight environment, making sure that a foresight exercise is executed every now and then. It firstly connects the partners and secondly, it might reveal hidden thoughts and issues. This creates transparency and will also detect whether the capacity of the partners is still sufficient for an effective and efficient execution of the partnership. Also, contingency factors might change throughout the partnership, changing the context and boundaries of the partnership.

➔ **Scenario 2: Partnership established, but non-optimal efficiency**

If the partnership is established, but its efficiency is under debate, the dynamics within the partnership has a negative impact on its throughput and consequently the output of the partnership. This could broadly have two causes: (1) critical success factors have not been determined well or not put in practice well, or (2) insufficient attention is paid to

identifying lessons learned and putting them into practice. The first relates to insufficient attention to acquiring input from all partners and cooperation, while the second relates to insufficient attention to feedback and revision.

Critical success factors should be determined in a group process, as these factors differ per partner and relate to the type of partners and way of cooperation between them. Also contingency factors determine the critical success factors. Therefore, it is important to get input from all partners. Brainstorming and a SWOT analysis will result in various ideas and by means of a multi-criteria analysis and Delphi study, the importance and the impact of these ideas could be judged. A stakeholder analysis will assist in determining what partners want, what they experience to be bottlenecks and strengths, and how they would like to cooperate with the other partners. This discussion should also entail the governance structure and how information is shared.

For lessons learned it is more appropriate to indicate them individually, as partners might be more reluctant to share their weaknesses and bottlenecks. It should be the task of the leader of the partnership to ask the partners individually for input and the reasoning behind this input. Interviews are most suitable for this. The leader of the partnership could then analyze and combine the indicated lessons learned and put them (possibly anonymously) forward in a group discussion. All partners combined should then discuss these lessons learned and their relevance. It should be noted that relevance could be personal; what is not seen as relevant for one partner might be very relevant for another due to differences in tasks and responsibilities. However, relevance could also relate to the effort that is needed to deal with the indicated issues and their impact. A Delphi study or cross-impact analysis could assist in determining this. Based on that, a prioritization could be made.

Once the critical success factors and lessons learned have been identified, a crucial next step is to determine how these are going to be implemented. Again, all partners should be part of this discussion, as all will have different preferences and ideas. Some critical success factors and lessons learned might be more relevant for a smaller group of partners. For these it suffices to discuss those in subgroups, but the outcome of these discussions still need to be shared with the other partners. If the critical success factors and lessons learned are seen as a (sub)goal, roadmapping, modeling, and backcasting techniques could assist in finding the most optimal way of implementing them. If time is scarce, a multi-criteria analysis and Delphi study could assist in prioritizing them according to importance and the impact.

When implemented, it is essential to check every now and then whether all measurements are still correct, whether partners still feel that all necessary conditions are taken care of, and whether the implementation of these critical success factors and lessons learned actually result into improvements of the process of the partnership (throughput).

➔ Scenario 3: Partnership established, but non-optimal effectiveness

If the partnership is established, but its effectiveness not optimal, the partnership contributes less to the outcome than intended. More in specific the (potential) output of the partnership can be expected not to translate optimally into the intended outcome. Partnership effectiveness is not only related to transforming output into outcome, but also relates also to the question whether the partnership adds value to solving the issue at hand. Reasons for a lacking impact of output on outcome can be that (1) the outcome is not defined properly, (2) the outcome cannot be measured properly, and (3) the partnership lacks capacity to create additional outcome (the counterfactual). Foresight is particularly relevant for improving the outcome definition. Three reasons for not properly defined outcome exist. Firstly, it could be that the intended outcome is not shared, which

probably already results in different output measures than intended. To find out whether this is the case, scenario 2 comes at hand. Secondly, it could be that the intended outcome is indeed shared, but that it is not in line with the intended output. This could show a lack of communication within the partnership. The executing partners do not report sufficiently on what is being achieved, what is going well and what is not going well, and what changes should be made. Or, the executing partners do report this, but the partners with more authority and decision making power do not take their input sufficiently into account. Exchange of information and accountability of what is done with this information should be stimulated. Expert panels could provide information on what should be changed. Simulation and modeling could reflect what will happen after certain adjustments, while the wildcards technique could assist in coming up with more out-of-the-box ideas for adjustments. Key is that communication between the partners is enhanced.

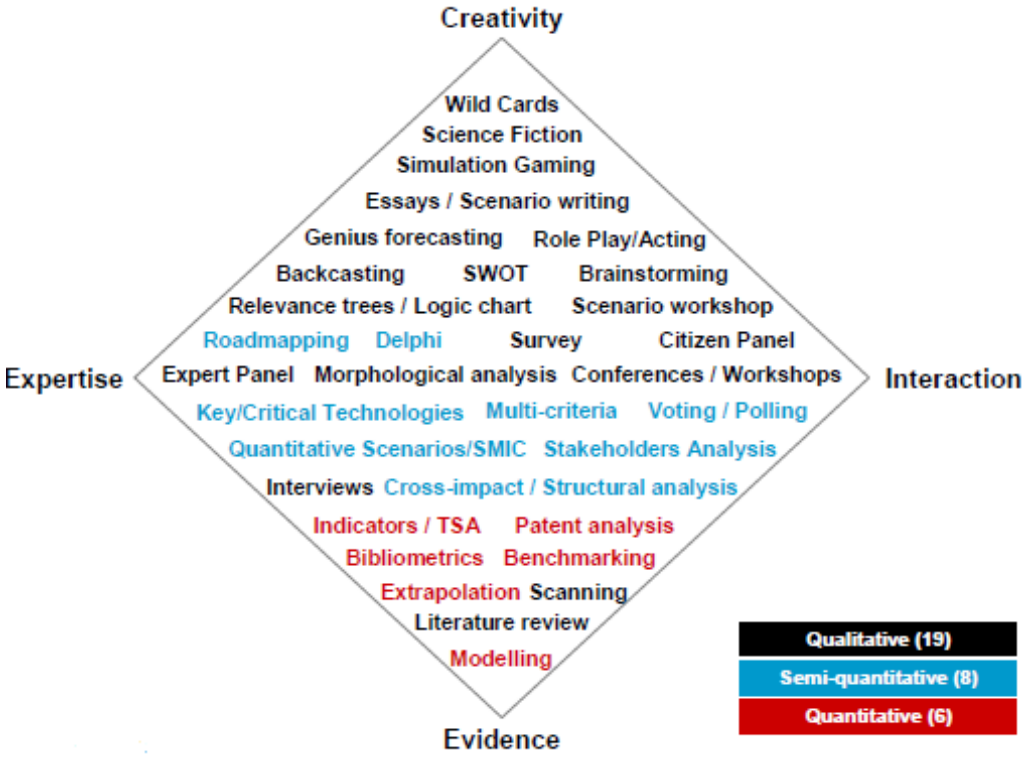
Thirdly, it could be that the partnership focuses too much on the output, thereby taking the translation into outcome for granted. Explicitly addressing this and discussing what the outcome should be will direct attention to the outcome. Scenarios, simulation, and modeling techniques focus on a desired end goal, which should be the outcome instead of the output. If certain ways of translating output into outcome have been identified, a SWOT analysis could assist in determining the most suitable options. It should also be made sure that partners are not judged based on output but on actual outcome. A requirement is that outcome is made measurable.

In case there is no improvement in the attributional link between output to outcome, it would be recommendable to fundamentally rethink the appraisal phase of the partnership and subsequently redesign the whole design of the partnerships. Starting from the envisioned outcome, foresight could be used again to set the appraisal phase and define the input. Scenarios 1 and 2 can help. Awareness of differences and similarities between partners regarding objectives and motives, and subsequently alignment of partners is crucial.

ANNEX: *23* FORESIGHT METHODS

This annex summarizes the most often used Foresight approaches. It categorizes the various methods, distinguishes key functions, and specifies criteria for selecting a particular foresight method. Subsequently, possible foresight sequences are presented and discussed. Thirty-three generally recognized foresight methods were categorized by Nugroho and Saritas, (2009) and Popper et al. (2007) in the form of a diamond (Figure 8)

Figure 8 The Foresight Diamond



Source: Popper et al. (2007)

The four dimensions of this diamond are:

- **Creativity**: The mixture of original and imaginative thinking and often provided by technology 'gurus', via genius forecasting, backcasting, or essays. These methods rely heavily on the inventiveness and originality of skilled individuals, such as science fiction writers, or the insights that emerge from groups involved in a brainstorming or wild cards session.
- **Expertise**: The skills and knowledge of individuals which is used to support top-down decisions, provide advice, and make recommendations.
- **Interaction**: Expertise often gains significantly from interaction with other experts and also with the perspectives of non-expert stakeholders. Since foresight activities

often take place in societies with democratic ideals and legitimacy is normally gained through 'bottom-up', participatory, and inclusive activities, it is key that they not just rely on evidence and experts.

- **Evidence**: It is important to attempt to explain and/or forecast a particular phenomenon with the support of reliable documentation and means of analysis of, for example, statistics and various types of measurement indicators. These activities are particularly helpful for understanding the actual state of development of the research issue. (All based on Popper et al., 2007).

In methodological terms, Foresight juxtaposes two approaches (Keenan, 2006): (1) exploratory versus normative and quantitative versus qualitative

[1] Exploratory (outward bound) vs. Normative (inward bound)

- Exploratory methods begin from the present and see where events and trends might go. They move forward to the future, either on the basis of extrapolating past trends or by asking "what if?" questions about the implications of possible developments that lie outside of these familiar trends.
- Normative methods ask what trends and events would lead to a specific future or futures. They start with a preliminary view of a possible (often desirable) future or futures. Then they work backwards to see if and how these futures might (not) grow out of the.

[2] Quantitative vs. Qualitative

- Quantitative methods rely on numerical representation of developments, data that has been mathematically processed or on extrapolation of trends. They allow for examining change but they limit the understanding of important political and social variables. Quantitative data may come from statistical sources or are the products of expert judgment. Disadvantages are that some issues are difficult to represent in numerical terms, the quantifiable elements of a phenomenon do not necessarily represent its essence, it could be too restricted to concepts and indicators, and some of the advanced statistical methods and modeling techniques have a high degree of complexity that could be difficult to understand.
- Qualitative methods are often used where key trends or developments are hard to capture via simplified indicators or where such data is not available. They are useful to stimulate creativity and intuition, and to stimulate engagement and dialogue. The outcomes are illustrations that describe complex processes and interaction among variables.

The choice of method is vital, but it often appears that practitioners choose the most fashionable method or the one they have experience in (Miles, 2007). The method needs "to reflect the resources available and the objectives of the exercise" (Miles, 2007:2). It is also important to constantly check whether the choice of method is appropriate to the context and actually works in practice (Thinking Futures). The difficulty, however, is that there is no one best foresight method and at the same time, the use of method is the backbone of all foresight studies. Each method suits best to a particular set of objectives, resources, context, and the mindset of the participants (FOR-LEARN).

Regarding the foresight study's objective, FOR-LEARN distinguishes three basic functions:

- **Diagnosis**: Understanding where we are. This function will probably involve a scoping of the issues and gathering of data. Amongst others, environmental scanning,

trend extrapolation, structural analysis, and morphological analysis/Relevance tree are apparent choices.

- **Prognosis**: Foreseeing what could happen. This function involves thinking about possible futures and their implications. Distinct possible futures could be found with scenario building, while a Delphi study could be used to provoke discussion.
- **Prescription**: Deciding what should be done. This function originates in strategic planning. A preferred future could be found with roadmapping, for identification of nature and timing of decision points backcasting could be used and modeling and simulation could be useful in case of a large variety of possible routes. If there is a high level of interaction between possible futures, cross-impact analysis could provide insights.

These functions may be attributed to a particular phase of the foresight study, but could also constitute a foresight study in its own right. Regarding the feasibility of the foresight study, it is said that a foresight exercise will be only justified by its subsequent impacts (FOR-LEARN). Therefore, it is advisable to first find out whether the context allows a particular foresight method and yields valuable impact, before committing resources. FOR-LEARN identifies the following practical considerations when choosing a method:

- Build on existing material: A sound 'common-sense' method could fulfill the role of a more formal and resource-consuming method if sizable information is already available. Then, possibly not the whole diagnosis function needs to be carried out.
- Mind the costs: The cost of the methods differs greatly and therefore, availability of resources should be taken into account when selecting a method. Not having sufficient financial resources could lead to not satisfying results, while a less sophisticated tool could have been chosen instead.
- Mind participants' availability: Methods could rely heavily on the participation of key actors, specific experts, societal groups or a large number of participants. As it could be difficult to secure the adequate level of participation, checking whether the needed engagement is possible is advisable.
- Mind the time: The implementation of some foresight method takes more time than implementing others. Therefore, the timeframe of the exercise should be kept in mind. For instance, when the results are expected and whether these expectations could be met with the selected method.
- Mind the skills: Each method needs certain competencies. Before starting with a method it should be assured that these skills are available

Combining these various characteristics leads to the following overview[2] of leading foresight methods and techniques (Table 2). One cross (X) indicates that the feature is part of the method – but does not prevail - two crosses indicate that the feature is a dominant part of this method.

[2] Not all 33 methods of the Foresight Diamond are included separately in this overview. Scenario building is taken as the combination of scenario workshop and essays/scenario writing. Bibliometrics, indicators, and trend analysis are also very similar, therefore they are combined. Likewise are survey, citizen panels, and voting/polling, interviews and conferences/workshops as well as genius forecasting and science fiction. Also patent analysis is combined with key & critical technology study, since patent analysis is an aspect of technology.

Table 2 Characteristics of major foresight methods

	Diagnosis		Prescription		Qualitative		Exploratory		Open
Methods & Tools		**Prognosis**		**Quantitative**		**Normative**		**Predictive**	
Backcasting		X	XX	X	X	X		X	
Benchmarking	X		XX			X		X	
Brainstorming / Mindmapping	X	XX	X		X	X	X		X
Cross-Impact Analysis / Structural analysis		XX		X	X		X		X
Delphi survey	X	X	X	X	X	X	XX	X	
Environmental Scanning	XX			X	X				
Expert Panels		XX	X		X	X	X		X
Genius forecasting / Science fiction		XX			X	X		XX	
Interviews / Conferences & Workshops	X		X		XX	X	X		X
Key & Critical Technology Study / Patent analysis	X	X	XX	X	X	X		X	
Literature review	XX			X	X		XX		
Modeling	X	XX		X			X	X	
Morphological Analysis		XX	X		X	X			X
Multi-Criteria Analysis			XX	X	X	X		X	
Relevance Trees / Logic Chart		XX	X		X	X			X
Roadmapping		X	X		X	XX	X	X	
Scenario Building		XX			X	X	X		X
Simulation gaming / Role playing	X	XX			X		X		X
Stakeholder analysis	X		X		X		X		X
Survey / citizen panels / Voting & Polling	X			XX		XX			X
SWOT Analysis	XX	X			X		X	X	
Trend Analysis & Extrapolation / Bibliometrics / Indicators	X	XX		X	X		X	X	
Wild cards	X	X			X		XX		X

Source: based on FOR-LEARN (http://forlearn.jrc.ec.europa.eu/ guide/4_methodology/ methods.htm), which adapted this overview from Glenn and Gordon's Futures Research Methodology, version 2.0.

[1] Backcasting

Backcasting starts with a predetermined end point, which is most of the time a plausible and desirable future or future vision. Then, possible paths to that point are thought of and investigated. Storylines work back from that desirable future or future vision to the present. Backcasting is commonly used in aspirational scenario workshops. It then involves creating a desired future and then imagining all necessary events and actions that need to happen for that future to be achieved. Some people consider backcasting as a less extensive version of roadmapping as both require setting up a timeline. This timeline includes key events and measurable goals to be reached. Another objective is to identify strategies and policies that are required to approach the desired future.

[2] Benchmarking

Benchmarking involves comparing the activities (process benchmarking) and performance (target benchmarking) of a system, with those of similar entities elsewhere. This way of comparing systems has a long history, but the interest in the approach has grown as firms sought to compare themselves with best practices. This has extrapolated to sectoral and regional or national levels. It offers learning opportunities ("how do they achieve that?"), as well as scope for setting goals ("we will be up to that level by the year 2010") and identifying competitive challenges.

Benchmarking could be very reductionistic, if performances in terms of certain indicators are abstracted from the systemic context of the system in question. It is important to examine the topic area well, to identify the most appropriate issues around which to build indicators and to investigate which indicators might be most useful.

[3] Brainstorming / Mindmapping

Brainstorming is a creative and interactive method used in face-to-face and online working sessions to generate new ideas around a specific topic. The aim is to remove inhibitions and break out of narrow and routine discussions, as it allows people to think more freely and to propose new solutions to problems. The brainstorming process starts with a period of freethinking, which is used to articulate and capture ideas, with no critical comments, followed by more rigorous discussion of these ideas, typically involving grouping them and prioritizing the most important themes.

Brainstorming is a starting point and should not be expected to generate output that could be directly used in reports, etc. It is important to maintain openness and to prevent animosity, especially where participants are inhibited or liable to express ideas that are offensive to other group members.

Mindmapping is a form of brainstorming, but here the main aim is to organize and visualize the subjects of group discussion, presenting these in ways that could help move the discussion forward. They involve grouping and linking ideas, drawing on the ideas expressed in the group. Mindmapping could be aided with computer and software tools. However, experience with these methods is still limited and conclusions as to best practice and best tools remain to be consolidated.

[4] Cross-Impact Analysis / Structural analysis

The cross-impact method recognizes that the occurrence of an event could affect the likelihoods of other events. Probabilities are assigned to reflect the likelihood of an event in the presence and absence of other events. The resultant intercorrelational structure could be used to examine the relationships of the components to each other, and within the overall system. Statistical processing of the data results in assignment of probabilities to the scenarios resulting from the combinations of events. The advantage of this technique is that it forces forecasters and policy-makers to look at the relationships between system components, rather than viewing any variable as working independently of the others. On the other hand, the method requires the experts to make difficult judgments about combinations of events and it has to limit the number of these judgments, resulting in that only a few key variables could practically be examined.

Phase 1 Defining the events
Phase 2 Estimating the initial probability of each event
Phase 3 Defining the cross-impact probability matrix
Phase 4 Calibration run of the cross-impact matrix
Phase 5 Defining the sensitivity test to be run with the matrix
Phase 6 Performing the cross-impact calculations for sensitivity test
Phase 7 Evaluating results

[5] Delphi survey

A Delphi study is a well-established technique that involves repeated polling of the same individuals, feeding back (sometimes) anonymized responses from earlier rounds of polling, with the idea that this will allow for better judgments to be made without undue influence from forceful or high-status advocates. A Delphi study produces a rapid narrowing of opinions and is mostly employed to elicit views as to whether and when particular developments may occur, but it could be used for any sort of opinion or information. This method seeks to rectify the problems of face-to-face confrontation in the group, so the responses and respondents remain anonymous.

Phase 1 The Formulation of the Problem
Phase 2 Choosing the Experts
Phase 3 Distributing the Survey and Collecting the Results

Delphi surveys are usually conducted in two or three rounds. In the first round, the participants are asked to write their predictions. Successive questionnaires are sent in order to reduce the variance of opinion, and to determine the precise median. During the second round, the experts, having been informed of the results of first round, are required to supply a new response. This new, modified response must also be justified by the expert if it deviates too much from the average. During the third round, each expert gives a definitive response, from which a median may be obtained, as well as a standard deviation.

[6] Environmental Scanning

Environmental scanning is a detailed analysis of main issues around a particular sector/theme. It seeks social, technological, environmental, economical, and political (STEEP) information across international, national and local domains, relating to the future viability of a system and success in meeting its strategic objectives. The aim is to develop a view of where important developments are taking place, what trends need to be

watched, who the key players are and might be. Methods used here are very varied: systematic analysis of media and Internet, content analysis tools (to indicate emerging social attitudes and political movements), review of reports from financial analysts (to suggest emerging markets or business models), and examination of specialized databases.

[7] Expert Panels

Expert panels are groups of people dedicated to discussion and analysis, combining their knowledge concerning a given area of interest. They could be local, regional, national or international. Panels are typically organized to bring together "legitimate" expertise. Panels require open-minded and creative team workers, who speak as experts rather than as interest group representatives. Too narrow representation is liable to result in limited analysis, "capture" by interest groups. It is vital to retain legitimacy.

The main task of an expert panel is usually synthesizing a variety of inputs (testimony, research reports, outputs of forecasting methods, etc.) to provide a vision of future possibilities and needs for their topic areas. Implicitly or explicitly, methods must be employed to select and motivate the panel, assign tasks, and to activate them in the development and sharing of knowledge. Panel work is highly significant to foresight: gathering relevant information and knowledge, and stimulating new insights and creative views and strategies for the future.

[8] Genius forecasting / Science fiction

Genius forecasting uses the insights of important individuals to provide a vision of the future. Such an individual will usually be drawing on the work of many colleagues, but be synthesizing these ideas in a new way for the current circumstances. It is based on a combination of intuition, insight, and luck. Psychics and crystal ball readers are the most extreme case of genius forecasting. Their forecasts are based exclusively on intuition. Science fiction writers have sometimes described new technologies with uncanny accuracy.

The weakness in genius forecasting is that it is impossible to recognize a good forecast until the forecast has come to pass. Also, this work is often dismissed as one person's viewpoint, as few individuals have the span of knowledge required to cover a wide enough range of issues confronting us. Mainstream science generally ignores this fact because the implications are simply too difficult to accept. The current understanding of reality is not adequate to explain this phenomenon.

[9] Interviews / Conferences & Workshops

Interviews are a fundamental tool of social research. In foresight they are often used as formal consultation instruments, intended to gather knowledge that is distributed across the range of interviewees. This may be tacit knowledge that has not been put into words, or more documented knowledge that is more easily located by discussions with experts and stakeholders than by literature review. Interviews play an important role in the evaluation of foresight (e.g. assessing how well resources are being or have been used).

Future workshops are events lasting from a few hours to a few days, in which there is typically a mix of talks, presentations, and discussions and debates on a particular subject. The events may be more or less structured. Participants may be assigned specific detailed tasks. The feedback of participants is used to improve the scope of the process. In this workshops are similar to interviews, providing in-depth information on a particular topic, only containing more people at the same time.

[10] Key & Critical Technology Study / Patent analysis

The key or critical technology study involves elaborating a list of key technologies that are of importance to a particular sector, region, or country. A technology is key if it contributes to the creation of wealth, helps improving the quality of life, is critical to corporate competitiveness, or influences other technologies. It most of the time starts with choosing the key technologies, for example by means of surveys or expert panels, and then continuous with a prioritization process.

Patent analysis provides strategic information on technologies and could be used to indicate competitive advantage based technological leadership. It could compare companies, countries, and different technology areas. Patent analysis could be assess quantitatively, in which statistical methods are used to calculate the number of patent registrations, or qualitatively, focusing on the contents of the patents. The main disadvantage is that information on patents normally is quite outdated and some industries do not really make use of them.

[11] Literature review

Literature review is a key (desk research) part of any scanning processes. Good reviews are structured around themes and related theories. The review may seek to explicate the views and future visions of different authors. It involves the analysis of books, reports, journals or websites, and most often requires an expert in the topic concerned using their existing knowledge of the field to identify crucial contributions and synthesize their implications for the topic at hand. A literature review could form the basis on which the foresight exercise is build.

[12] Modeling

Modeling normally refers to using computer-based models that relate values of particular variables. The number of variables could range between two or three for simple models to hundreds or thousands for very complex models. Models could be used in planning activities. Most future studies use models with nonlinear variables and once with difficult calibration, for example system dynamics. The current technology improvements simplifies the modeling activity, as computers and spread sheets could be used for the calculations.

[13] Morphological Analysis

Morphological analysis aims to explore possible recombinations of constituent elements of a given system by seeking to identify the circumstances, capabilities, actions, and knowledge needed to achieve future objectives. It involves mapping “all possible” solutions to a problem, so as to determine different future possibilities. This method is principally used for the construction of scenarios, but it is equally well suited for both technological forecasting and elaborating potentially new products through the recombination of technologies, services, etc. The approach requires in-depth analysis, drawing on expertise in the problem fields, and involving lengthy work. The powerful intellectual stimulus they could provide may not require absolutely exhaustive analysis, but still considerable inputs of time and critical judgment are required.

Phase 1 The Construction of Morphological Space

Phase 2 Reduction of Morphological Space

[14] Multi-Criteria Analysis

Multi-criteria analysis is a future technique that supports decision making and prioritization, especially for complex situations in which multiple criteria need to be

weighted on their effect on a particular intervention. Most of the time, participants are asked on their assessment of the importance of various criteria and the impact of options, strategies and/or options on the criteria. The scores are calculated based on these judgments and followed by sensitivity analyses. This type of foresight methods requires many participants who might feel that the logic is lost. However, an advantage is that a comparative summary of the judgments and outcomes could be obtained.

[15] Relevance Trees / Logic Chart

The relevance tree method aims to aid the team in its selection of various strategic actions which might be taken to satisfy global strategic objectives. It was originally applied in the domains of military and technological R&D. A relevance tree subdivides a broad topic into increasingly smaller subtopics, in terms of a tree-like diagram. It sets out various aspects of a system, a problem, or solutions to a problem. The approach requires in-depth analysis, drawing on expertise in the problem fields, and involving lengthy and hard work.

It originally evolved as graphical devices to help illustrate the structural relationships between alternative choices. These trees were originally presented as a series of yes/no (dichotomous) choices. As our understanding of feedback loops improved, the trees became more complex. Their structure became the foundation of computer flow charts. Computer technology has made it possible create very complex decision trees consisting of many subsystems and feedback loops. Decisions are no longer limited to dichotomies, as they now involve assigning probabilities to the likelihood of any particular path.

Phase 1 The Construction of the Tree of Relevance

Phase 2 Noting the Graph and the Aggregation of Data

[16] Roadmapping

Roadmapping has three aims. Firstly, to identify barriers to the emergence of a hydrogen future and the measures needed to overcome them. They explore and, often graphically, communicate the relationships between future markets, technologies and policies. Secondly, to fulfill an advocacy function. Lastly, it seeks to bring together key stakeholders to develop a shared vision of the future: a common ‘script’, defining agreed roles and cues for action.

The great strength of the roadmapping approach is the identification of barriers and solutions to them, and generation of shared targets. While the process itself is often important in terms of bringing together stakeholders in a common strategic forum, the final roadmap itself also provides a measure against which progress could be measured. As tangible outputs, the roadmapping process has documents describing some subset of the following: the challenge(s) to be solved, key platforms, processes, and technologies required to reach solutions, diagrams, timelines, and milestones, investment requirements and resource estimates, technology and demand forecasts, and risk analyses. As less tangible yet real benefits, roadmapping could result in a shared understanding of the problem space and a shared vision of how to solve it, a network of contacts, and ongoing formal and informal communication that helps move solutions forward.

Building a roadmap usually involves groups of stakeholders identifying the drivers, barriers, targets, and wider threats and opportunities. Some roadmaps are less inclusive, and are produced by advocates of particular policy routes. The approach is very pragmatic. Policies are usually identified for the short term (5–10 years), with targets mapped out over the longer term (up to 2050 and beyond).

[17] Scenario building

The scenario is a narrative forecast that describes a potential course of events. It is a prospective method for exploring the future. Like the cross-impact matrix method, it recognizes the interrelationships of system components. The scenario describes the impact on the other components and the system as a whole. It is a "script" for defining the particulars of an uncertain future. Scenarios are written as long-term predictions of the future. The primary purpose of a scenario is to provoke thinking of decision makers who could then posture themselves for the fulfillment of the scenario(s). An important feature of exploratory scenarios is that the storylines are not supposed to be driven by a preconceived desirable end-point.

Scenarios may be produced by means of deskwork, workshops, or the use of tools such as computer modeling. Scenario workshops commonly involve working groups dedicated to the preparation of alternative futures. There are numerous ways of articulating and elaborating such scenarios, of which using a 2*2 matrix crosscutting key parameters is the most common type.

In general, the scenario approach involves the following phases:
Phase 1 Identify Focal Issue or Decision
Phase 2 Key Forces in the Local Environment
Phase 3 Driving Forces
Phase 4 Rank by Importance and Uncertainty
Phase 5 Selecting Scenario Logics
Phase 6 Fleshing Out the Scenarios
Phase 7 Implications
Phase 8 Selection of Leading Indicators and Signposts

[18] Simulation gaming / Role playing

The primary aim of simulation gaming is to identify the pattern of a system's behavior, which is formed according to given presumptions and which represents the value range that the nodes of the map could achieve.

The simulation is not intended for forming exact quantitative values, instead, its content is mainly qualitative. Simulation methods involve using analogs to model complex systems. These analogs could take on several forms. A mechanical analog might be a wind tunnel for modeling aircraft performance. An equation to predict an economic measure would be a mathematical analog. A metaphorical analog could involve using the growth of a bacteria colony to describe human population growth. Game analogs are used where the interactions of the players are symbolic of social interactions.

Especially mathematical analogs are of importance to futures research. However, the complexity of social systems makes it difficult to include all the relevant factors in any model. Gaming analogs are also important to futures research. It involves the creation of an artificial environment or situation. Players (either real or computer) are asked to act out an assigned role. The role is a set of rules that is used during interactions with other players. While gaming has not yet been proven as a forecasting technique, it does serve two important functions. First, by the act of designing the game, researchers learn to define the parameters of the system they are studying. Second, it teaches researchers about the relationships between the components of the system.

[19] Stakeholder analysis

A stakeholder analysis is a strategic planning technique that takes into account the interests of the various stakeholders. This to identify key objectives in a system and to identify potential conflicts and strategies. The MACTOR technique takes this method a step further by systematically considering which stakeholders are in favor in which are against certain objectives. This information could be used for building scenarios, action plans, and stakeholder strategies. The method requires in-depth and reliable information from the various stakeholders. An advantage is that this method clearly depicts the relevant stakeholders and their strategies, reducing uncertainty.

Phase 1 Construction of a table "Actors' Strategies"
Phase 2 Identification of strategic stakes and objectives related to those stakes
Phase 3 Positioning of actors in relation to their objectives and the identification of convergences and divergences
Phase 4 Ranking of priorities of objectives for each actor
Phase 5 Evaluation of important relationships amongst actors
Phase 6 Integration of important relationships in the analysis of convergences and divergences
Phase 7 Formulation of strategic recommendations and key questions about the future

[20] Survey / Citizen panels / Voting & Polling

Surveys, panels and polling involve groups of people dedicated to discussion and analysis, combining their knowledge concerning a given area of interest. They could be local, regional, national or international. Panels are typically organized to bring together "legitimate" expertise, but could also attempt to include creative, imaginative and visionary perspectives. In many exercises, panel members are also expected to influence the decision-making environment.

Questions could be related to what the most optimal solution is for a particular topic, what the key drivers are, whether and when a particular event is going to happen, but could be also related to the successfulness of policy making and whether particular policy decision and their implications are welcomed or not by the citizens.

[21] SWOT Analysis

The SWOT analysis is a method which first identifies factors internal to the organization in question (e.g. particular capabilities, brands, etc.) and classifies them in terms of strengths and weaknesses. It similarly examines external factors (broader socioeconomic and environmental changes, the behavior of opponents, competitors, markets, etc.) and presents them in terms of opportunities and threats. This is then used to explore possible strategies, developing and building on strengths and overcoming or accommodating weaknesses, providing insight as to the resources and capabilities required to deal with changing environments, and so on. It is very widely used for strategy formulation and decision making.

SWOT analysis is used to provide background inputs to foresight activities. Sometimes main foresight activities will also result in analysis presented in SWOT terms, for example out of Delphi studies, but usually SWOT is less based on an assessment of the longer-term. Opportunities and threats are prioritized in terms of their importance and probability, while strengths and weaknesses are prioritized in terms of importance to performance to each factor.

Failures in SWOT analysis often reflect inadequate definition or prioritization of factors. This may be due to an absence of real expert knowledge, the reiteration of

standard analysis by consultants unfamiliar with local specificities, or political pressures of associated desire to downplay regional/national weaknesses. It is also possible to underestimate one's strengths. Repeated disappointments may lead to local common sense becoming fatalistic and supporting the view that a region is inevitably disadvantaged in certain respects, failing to examine any evidence that suggests the contrary.

[22] Trend Analysis & Extrapolation / Bibliometrics / Indicators

Trend analyses and extrapolations are amongst the longest established tools of forecasting. Trend analysis uses past and present developments and tries to see how these trends may look in the future, assuming that the future is a kind of continuation of the past. There may be large changes, but these are extensions of patterns that have been previously observed. Essentially, it is assumed that certain underlying processes will continue to operate, driving the trend forwards.

Trend extrapolation projects trends forward, usually by mathematical or statistical equation-fitting. Extrapolation could forcefully indicate the scale of change that would follow from a trend continuing into the longer-term. It is important to identify what forces are driving a trend (and whether these will persists) and what assumptions about such forces are built into the extrapolation.

Whether the forces responsible for the current trends will continue to operate in the future is often a valid assumption when forecasting short term horizons, but it falls short when creating medium and long term forecasts. The further out we attempt to forecast, the less certain we become of the forecast. The stability of the environment is the key factor in determining whether trend extrapolation is an appropriate forecasting model.

Bibliometrics may be executed as a basis for trend analysis. It is a method based on statistical and quantitative analysis of publications. This could for example result in an assessment of the most influential pieces in a specific area. Another way is to chart the number of publications and how they evolve over time.

Megatrend analysis is a particular type of trend analysis. A megatrend is a collection of trends, patterns of economic, social or environmental activity that will change the way people live and the science and technology products they demand. The method, in which current and past statistical data is used to construct the variance of e.g. demographic developments, ecological sustainability, economic trends, and technological progress in various time series, provides forecasts based on the theory of cause and effect.

[23] Wild cards

The wild card method is a workshop-type activity aimed at the identification of possible events which may challenge the occurrence of 'highly probable' situations or aimed at the identification of disruptive events and situations. Identification results in a large portfolio of wild cards. There relevance could be assessed by quantifying the relative impact that a particular wild card might have on the assessor's target group.

Wild cards could originate from quite different sources: unintended consequences of human action or unknown processes in nature. Generally, they could be systematized according to their origin e. g. along STEEP sectors (society, technology, economy, environment, politics). From an epistemological point of view it is useful to distinguish three types of surprises: (1) events that are known and relatively certain to occur but without any certainty as to timing, (2) future events that are unknown to the general public but that could be discovered if we only consulted the right experts or if we had adequate models, and (3) intrinsically unknowable future events that no expert has in mind, where we lack concepts and means of observation.

The wild card method provides an approach to overcoming blind spots in our perception of the future. It focuses on possibilities, usually forgotten or underrated, on wild and strange ideas, which nevertheless have the potential to occur and to determine the future shape of things. It helps to survey the whole horizon, to question one's own mindset, and to understand dramatic change. However, identification of Wild Cards seems an easy exercise, but the problem is to not end up with the usual suspects of intellectually not very challenging catastrophes and disasters. Another difficulty arrives when one draws conclusions and tries to implement them. These conclusions are often counterintuitive or in contradiction to well-established convictions or to lines of action already firmly established. Therefore, barriers of acceptance may be high.

Phase 1 Identify high-interest Wild Cards and segment them
Phase 2 Determine what kinds of lesser events would point to the coming of a Wild Card
Phase 3 Put in place a dedicated scouting group that looks for early
Phase 4 Ensure that all organizational units are aware of general concerns and interests
Phase 5 Structure incoming information: indicators, new events, unknowns, and confirmations
Phase 6 Develop an ability to display information in ways that suggest what might happen
Phase 7 Understand the high-interest Wild Cards and decide what could be done about them
Phase 8 Create an action plan to influence those selected potential events that could be influenced

(All these discriptions are based on a combination of the following sources: Banuls and Salmeron, 2007; Biloslavo and Dolinsek, 2010; Clemens; 2009; Flowers et al., 2010; Glenn, 2008; Glenn and Gordon, 2009; Godet, 2006; Keenan, 2006; Masum et al., 2010; McDowall and Earnes, 2006; Miles, 2007; Popper, 2008; Popper et al., 2007; Thinking Futures, Unido, 2004; Walonick, 2010)

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