Applying Socio-economic Scenarios in Climate Assessments

van Drunen, M.A.; Berkhout, F.G.H.

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Michiel van Drunen

Frans Berkhout

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IVM
Institute for Environmental Studies
Vrije Universiteit
De Boelelaan 1087
1081 HV Amsterdam
The Netherlands
Tel. +31-20-5989 555
Fax. +31-20-5989 553
E-mail: info@ivm.falw.vu.nl

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1 Introduction

1.1 Why socio-economic scenarios are relevant

By the end of this century, the world will look totally different. The economies in some countries will grow very fast, whilst in others they will grow less or even shrink. In some the populations are growing quickly which implies that more people will be affected by climate change. They will need more food, water, places to live and energy than nowadays (Tol, 1998). Furthermore, innovations in e.g. transport, information technology and food technology, and changes in lifestyle and governance will affect society dramatically (Berkhout and Van Drunen, 2007).

More prosperous people will have more to lose when the climate changes, but they will also have more funds available to adapt. Therefore, it is important to assess how populations and economies will develop over the coming century and how this will affect the impacts of and adaptation to climate change (Tol, 1998). Since we cannot know the future, this is commonly done by setting up socio-economic *scenarios*. The definition of a scenario used in the Millennium Ecosystem Assessment (2005: xvii) is: ‘Scenarios are plausible, challenging and relevant sets of stories about how the future might unfold. They are generally developed to help decision-makers understand the wide range of possible futures, confront uncertainties and understand how decisions made now may play out in the future.’

Not only society changes, also the climate is expected to change. The relationship between climate scenarios and socio-economic scenarios are elaborated in Figure 1.

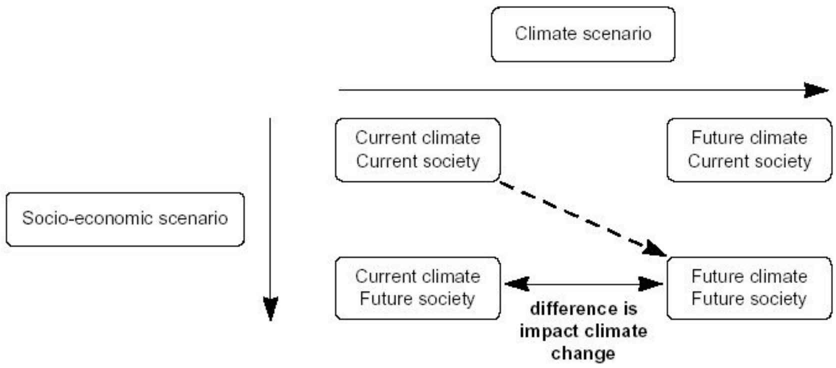

Figure 1 Climate and socio-economic scenarios (Source: Tol, 1998).

In climate assessments, future climate and future society scenarios need to be compared to the current climate and the current society. Main objective of such assessment is to seek for robust mitigation and adaptation strategies, i.e. strategies that would benefit society in all kinds of different scenarios.

1.2 Relationship socio-economic scenarios and climate scenarios

The SRES scenarios (IPCC, 2000) assess greenhouse gas emissions in four socio-economic scenario types. The IPCC Fourth Assessment Report (Meehl et al., 2007) applies these emissions scenarios to estimate the impacts on climate change. It concludes that (p. 749): ‘There is close agreement of globally averaged mean warming for the early 21st century for concentrations derived from the three non-mitigated [...] SRES scenarios. By mid-century (2046–2065), the choice of scenario becomes more important for the magnitude of [...] warming, with values of +1.3°C, +1.8°C and +1.7°C for B1, A1B and A2, respectively. About a third of that warming is projected to be due to climate change that is already committed. By late century (2090–2099), differences between scenarios are large [...].The warming and associated uncertainty ranges for 2090 to 2099 relative to 1980 to 1999 are B1: **+1.8°C** (1.1°C to 2.9°C), A1B: **+2.8°C** (1.7°C to 4.4°C), and A2 **+3.4°C** (2.0°C to 5.4°C).'

IPCC's Fourth Assessment Report estimates the effects of climate scenarios on the vulnerability of society (Schneider et al, 2007). It indicates that the impacts in several sectors are much higher if the temperature increase is 4°C compared to 1°C. On p. 781 the IPCC concludes: 'Global mean temperature changes of up to 2°C above 1990-2000 levels would exacerbate current key impacts, and trigger others, such as reduced food security in many low-latitude nations (medium confidence). At the same time, some systems, such as global agricultural productivity, could benefit (low/medium confidence). Global mean temperature changes of 2 to 4°C above 1990-2000 levels would result in an increasing number of key impacts at all scales (high confidence), such as widespread loss of biodiversity, decreasing global agricultural productivity and commitment to widespread deglaciation of Greenland (high confidence) and West Antarctic (medium confidence) ice sheets.' It can be concluded from Schneider et al. (2007) that the impacts of the different greenhouse gas emission scenarios are quite similar until mid-century because the anticipated average temperatures do not differ very much. But by the end of the century the climate change impacts in the high emission scenarios will be considerably more severe.

Hence it can be concluded that socio-economic development is not much affected by climate change until mid-century. Also, climate until mid-century is to a large extent determined by past greenhouse gas emissions and is therefore not much affected by socio-economic developments. Both interpretations are not valid anymore in the second half of the century. Then, the climate scenarios with the high temperatures are associated with the socio-economic scenarios that result in high GHG emissions.

1.3 Dealing with uncertainty: the scenario axis method

Scenario exercises may be defined as being either exploratory, extrapolatory or normative in approach. Exploratory approaches create a stylised 'model' of a system (such as the scenario-axes technique, see below) and make projections for the system given assumptions about the determinants of change. Most scenario studies take an exploratory approach (Berkhout and Van Drunen, 2007).

Global scenarios are exercises that provide an integrated picture of future developments and they are frequently used to frame global assessments of environmental problems (for example, climate change (IPCC, 2000) and biodiversity (Millennium Ecosystem Assessment, 2005)). By implication, they are concerned with characterizing multiple driving forces and contexts for change in the future. The main results include both specific projections (GHG emissions rates) and statements about the general state or capacity of global economic or ecological systems. Many global scenarios share common intellectual roots, share convergent visions of the future (see Table 1) and have applied the scenario-axis technique (Van 't Klooster and Van Asselt, 2006).

This technique comprises the identification of two key uncertainties that determine a graph with the subsequent axes. In each quarter of the co-ordinate system set-up by the key uncertainties narratives are drawn up: stories about the societies that would develop given the conditions set. In WLO the key uncertainties are formulated as follows: '(1) to which extent will nations and international trade blocks cooperate and exchange, giving up some of their cultural identity and sovereignty? (2) how will governments balance between market forces and a strong public sector?'

The main advantage of the scenario axis method are (Berkhout and Hertin, 2002):

- A degree of analytical rigour;
- The transparency of the process for broad groups of participants;
- The number of generated scenarios (four) presents a compromise: two are too narrow, three lead to a best guess (the middle one) and more than four is too difficult to manage.

Table 1 *Similarities between the socio-economic scenarios SRES (IPCC, 2000), WBCSD (1997), GEO-3 (UNEP 2002), WWV (2000), OECD (2001), Foresight Futures (2002) and WLO (2006). Source: Adapted from the Millenium Ecosystem Assessment (2005).*

Scenario	SRES	WBCSD	GEO-3	WWV	OECD	Foresight Futures	WLO
Conventional worlds							
Market forces	A1	FROG!	Markets first	B-a-u	Reference	World Markets	Global Economy
Policy reform	B1	GEO-Polity	Policy first	Technology and economics	Policy variants	Global Sustainability	Strong Europe
Barbarization							
Breakdown	A2					National Enterprise	Transatlantic Markets
Fortress world			Security first				
Great transitions							
Eco-communalism	B2					Local Stewardship	Regional Communities
New sustainability paradigm		Jazz	Sustainability first	Lifestyle and values			

Figure 2 *In the scenario axis method two key drivers or uncertainties determine the story lines. In WLO (2006) the drivers are globalization and individualization. Although the terminology is usually different, the other scenarios in Table 1 have a similar set up. Hence the SRES A1 scenario is comparable to the WLO scenario Global Economy.*

Storylines are qualitative descriptions of socioeconomic trends. For example, the storyline Global Economy includes phrases such as (WLO, 2006): 'European governments concentrate on their core tasks, such as the provision of pure public goods and the protection of property rights. They engage less in income redistribution and public insurance, so that income inequality grows. The problem of climate change intensifies. The negotiations in the WTO lead to a successful liberalization of global trade'.

In practice, the storylines as such do not offer much support for climate assessments and other studies. Therefore in addition to the storylines, all kinds of models are used to quantify key trends within each scenario. Commonly, such models generate data about the population, labor productivity, GDP, income distribution, energy consumption, mobility and land use in each of the four scenarios determined by the two axes. These models are calibrated with data generated in the past. Therefore, they have a limited time horizon (usually 2020 or 2040).

The scenario axis method does not result in *business as usual* scenarios: in all four story lines it is assumed that there are certain trends, e.g. an increase or a decrease in the globalization trend. However some of the WLO scenarios and other scenarios are considered to be only marginally different from business as usual (Van Drunen et al., 2007).[1]

1.4 Extremes and 'events' not addressed in common scenarios

In many cases, scenarios aim at exploring the impacts of sudden events, surprises, major shocks or *discontinuities*[2] in current trends, such as financial crises or environmental disasters. The IPCC and WLO scenarios recognized discontinuities, but they were considered inappropriate. Van Notten et al. (2005) argue that the dominance of the so-called *evolutionary paradigm* – the perception of a gradual, incremental unfolding of the world system through time and space – makes is difficult, if not impossible, to include discontinuities in the development of scenarios (see also Van 't Klooster, 2007b).

However it is possible to test if the developed scenarios are resilient towards discontinuities. Through brainstorming scenario developers can build up inventories of discontinuities by scanning conventional and unconventional sources. The resilience of scenarios can be tested to apply the discontinuity and assessing how easily they recover from or adapt to the impacts (Berkhout and Hertin, 2002).

1 More specifically: only Regional Communities is significantly different from business as usual according to some experts.

2 Defined by Van Notten et al. (2005) as: 'A temporary or permanent, sometimes unexpected, break in a dominant condition in society'. This change in direction can evolve slowly or happen suddenly.

2 WLO: The Future of the Dutch Natural and Built Environment

2.1 WLO and SRES

The WLO study (Welvaart en Leefomgeving - The Future of the Dutch Natural and Built Environment) (WLO, 2006) assesses the long-term effects of current policy, given the international economic and demographic context of the Netherlands. By exploring how land use and various aspects of the living environment may develop on the long run (2040), the study shows when current policy objectives may come under pressure, and which new issues may emerge. The study builds on earlier work by CPB in which the scenarios were translated into development paths for the Dutch economy and demography. In WLO, these scenarios were elaborated for application to the built and natural environment. The four WLO scenarios are shown in Figure 2.

In WLO approximately forty quantitative models were coupled. These models include a global model that assesses economic developments, trade and energy supply, national and regional demographic models, a labor market model, transport models for persons and freight, an agricultural model, energy models and environmental models (WLO, 2006: 205-209). The models are hosted by many different governmental and non-governmental organizations, such as CPB, MNP, RPB, CBS, RIVM, ECN, LEI, ABF Research and Louter Advies. In the calculations no feedbacks were included, such as the effects of congestion on economic growth and the recreational area size decrease on the demand for houses with gardens.

WLO assumes that the socio-economic developments are not different for the four KNMI climate scenarios. WLO has both exploratory and extrapolatory characteristics. The WLO research team initially divided the time frame into the period until 2020 and the period 2020-2040. They argued that the first period could be explored by trend extrapolations based on historical data sets. The second time period was considered as ‘the far future’. The researchers acknowledged that it in this time period existing structures and mechanisms will be changing or replaced by others. Therefore they wanted to explore a range of possible futures and uncertainties. However in the process of refining the scenarios, future images that are quite different from our existing world were considered unrealistic and therefore dropped in the analysis. This was observed by Van ’t Klooster (2007a: 140) who concluded that in WLO the historic-deterministic pattern of reasoning dominated not only in the time period until 2020, but throughout the whole period that was investigated.

The key trends assessed in WLO are economic growth, labor productivity, population growth, institutional development, international co-operation, energy use, mobility and congestion, and land use.

For climate assessments it is important to extend the time horizon to 2100 or even further. One of the few scenario studies that look into the second half of this century is the SRES study (IPCC, 2000). The SRES scenarios focus on greenhouse gas emissions and therefore specifically provide data about driving forces such as demographic development, socio-economic development, and technological change. Like the WLO study, SRES does not take into account new (climate) policies. As shown in Table 1, the SRES scenarios are quite similar to the WLO scenarios.

2.2 Choosing WLO scenarios

Van Drunen & Berkhout (2007) showed that WLO scenarios have already been applied in several climate assessment studies. Apparently, WLO generated figures and data that are useful. Ideally all four scenarios are taken into account in studies that assess socio-economic developments. However in practice, mostly only one or two scenarios are chosen, because of resource constraints. In some studies, scenarios are ignored because they are considered unlikely or irrelevant. From a theoretical point of view this selective 'shopping' may lead to a tunnel vision, because it is impossible to estimate which scenario is more probable than others. Therefore we recommend taking all four scenarios into account, especially in the first phase of the process (Foresight Futures, 2002).

In case of resource constraints, the most elegant approach is to estimate which scenario would lead to a worst case or which scenarios would lead to the least and most severe impacts. E.g. the LANDS project (Climate Change Spatial Planning: IC3) included the Global Economy (GE) scenario and the Regional Communities (RC) scenario, because it wanted to assess 'the extremes on both sides of the bandwidth in terms of socio-economic developments' (Riedijk et al, 2007: 23). Furthermore, LANDS associated the GE scenarios with the warm (W) KNMI 2006 scenarios and the RC scenario with the moderate (G) scenarios. The LANDS team argues that the RC scenario would lead to less greenhouse gas emissions resulting in a lower average temperature increase.

Although some scenario users consider RC unlikely, it is important to take this scenario into account, because:

- It is impossible to assess the likeliness of any scenario since we cannot know the future;
- It is very different from the other three scenarios; therefore it provides alternative insights.

In case it is necessary to limit the number of scenarios to be assessed it is recommended to follow the same procedure as the Lands project (see Table 2).

Table 2 Integrated scenarios in LANDS (Source: Riedijk et al., 2007: 23).

	Regional Communities	Global Economy
Circulation change	Moderate rise in Temperature (G+)	Strong increase in Temperature (W+)
No circulation change	Moderate rise in Temperature (G)	Strong increase in Temperature (W)

Foresight Futures (2002) recommends to combine scenarios in certain occasions when it is impossible to take all scenarios into account. In the Climate changes Spatial Planning (CcSP) programme this is not recommended, because such combinations would make it more difficult to compare the results of the individual projects.

2.3 Time scales and spatial scales

For many purposes, WLO data can be used directly. Unfortunately, WLO's time horizon is 2040, whilst in some climate assessments data about 2100 or even 2200 are desirable. TNO (Jonkhoff et al., 2008) made an attempt to extrapolate the WLO data to 2100 and to apply the KNMI climate scenarios (and two other, more extreme climate scenarios). However, as indicated in Section 1.3, the use of models applied in WLO beyond 2040 is questionable. Hence these results should only be used if this is taken into account.

WLO presents its spatially relevant data mostly on a regional level. The three regions defined are the *Randstad* (Noord-Holland, Zuid-Holland and Utrecht), the *Transition Zone* (Flevoland, Gelderland and Noord-Brabant), and *Other* provinces. Data on provincial level and COROP level are available from the WLO developers. For the theme water security, dike rings were chosen as spatial unit. The LANDS project (Riedijk et al., 2007) presented land use maps on a 100 meter grid based on the models and data provided by WLO.

An overview of the most important available data in Europe, The Netherlands, The Randstad, The Transition Zone and the other provinces in 2002, 2020, 2040, 2070 and 2100 is available from www.climatescenarios.nl.

3 How to apply scenarios

3.1 Scenarios applications

In general scenarios are used (Foresight Futures, 2002):

- To stimulate thought, or
- To use scenarios on specific sector or issue.

To stimulate thought, usually small scale events are organized. They start with a presentation of the scenarios, followed by a brainstorming session to consider the implications. Involving representatives from all interested parties is essential. The events are participative and serve as a mechanism to engage key people in the development of strategies (Foresight Futures, 2002).

To use scenarios on a specific sector or issue (e.g. the energy sector, or water security) data are required in addition to expert knowledge. Hence, scientific methods – usually models – need to be applied (Foresight Futures, 2002). The WLO study already did this for some sectors, such as agriculture and housing. The most difficult part here is to combine the qualitative, general story lines with quantitative models.

3.2 Steps to be taken

The steps to be taken include (Foresight Futures, 2002):

- **Engage stakeholders.** (a) Be open about the aim and the limitations of the scenario exercise. (b) Provide enough details about the scenarios to enable the stakeholders familiarizing with them. E.g. they can be asked in a workshop setting to connect future newspaper headlines to the different scenarios. (c) Explain what will be done with results.
- **Get the process right.** A typical structure for the workshop might be: aim of the process, introduction scenario approach, presentation of scenarios, elaboration of scenarios in break-out groups, feedback, planning next steps. Generally the workshop is moderated by a professional with scenario experience. It is important to devote equivalent efforts to all scenarios and to ensure that the subsequent scenarios remain distinct and coherent. Hence in several steps in the process they need to be carefully compared.
- **Adapting scenarios.** In general, scenarios need to be adapted for specific cases. E.g. in certain sectors the key drivers may be different than the ones chosen in WLO. It is also possible to introduce an additional driver. E.g. in SRES (IPCC, 2000) technological development was added to the A1 scenarios as a third driver. In the CcSP programme we recommend to connect as closely to the WLO scenarios as possible to enable comparing the different project results. In many projects policy recommendations will be generated. The robustness of these policies in the different scenarios can be tested similarly as in Nederland Later (MNP, 2007: 54). We recommend participants to think about possible feedback mechanisms, especially because they are mostly ignored in WLO. This allows learning processes to be taken into account. One option would be to organize this round of the evaluation as a 'game-playing' simulation.
- **Take account of discontinuities.** As indicated in Section 1.4, the resilience of scenarios can be tested to apply discontinuities and assessing how easily they recover from or adapt to the impacts. In case of slow changes in the direction of change one can shift from one scenario to another.
- **Integrate 'future thinking'.** Integration of scenario planning in organizations would make them more aware of early warning signs for trends and would develop ways of increasing their adaptive capacity. Many organizations would benefit from imbedding scenario routines in their decision making processes.

3.3 Key numbers

Ideally models would exist that enable scenarios developers to feed these models with there own inputs. For example, such models would generate scenarios for specific areas, years or sectors. Unfortunately reality is not that simple: for instance WLO includes over forty different models that are hosted by eight different governmental and non-governmental organizations (WLO, 2006: 205-209). Therefore, the IC11 team decided to present overviews of key numbers for different regions (EU15, The Netherlands, Randstad, Transition area and Rural area) and different years (2020, 2040, 2070, 2100). Table 3 provides an example of such key numbers. Scenario developers can use these numbers as a starting point for *downscaling* or *tailoring* scenarios according to there needs in workshop settings. In addition the numbers can be used for consistency checks. For example, Table 3 shows that in the Regional Communities scenario the GDP per capita is 23% lower than in Global Economy in 2020. This has many implications on e.g. financing public works for flood protection. Furthermore there are 1.5 million fewer people in Regional Communities than in Global Economy, which has significant implications for the number of new houses that needs to be built.

Table 3 Key numbers for The Netherlands in 2020. Source: Climatescenarios.nl (2009).

Theme	**Indicator**	**Unit**	**GE**	**SE**	**TM**	**RC**
Demography	Population	mln	18.0	17.7	17.0	16.5
	Labor participation	%	49	46	48	45
	Annual migration	1000	54	38	22	8
Economy	GDP per capita	k€	41.4	35.3	38.4	31.9
	Agr./Ind./CommServ./ NonCommServ.	%	2.1/21.2/ 55/22	2.0/21.2/ 56/21	2.0/20.9/ 57/20	2.3/20.2/ 54/23
	Income equality	--/0/++	--	0	-	+
Innovation	Labor product.	%/year	2.1	1.5	1.9	1.2
	Water security	M€/year	82	68	72	57
	Agriculture - labor prod.	%/year	3.8	2.7	3.0	2.6
	Energy consumption	PJ	4006	3555	3792	3215
	Energy- fossil	%	91	91	91	91
Spatial	Living	1000 ha	276	259	258	241
developments	Working	1000 ha	117	103	110	93
	Agriculture - animal husb.	1000 ha	1515	1488	1300	1457
	Agriculture - other	1000 ha	655	712	787	795
	Recreation	1000 ha	95	88	83	79
	Mobility	km/pp/yr	13944	13616	13823	13454
	Congestion	2002=100	127	87	81	64
	Nature	1000 ha	628	653	611	636
	Water storage increase 2002	ha	1758	1230	1186	581

3.4 Assessing adaptation and mitigation options

Once socio-economic and (combinations with) climate scenarios have been established, all kinds of plans with implications for the far future, including options for mitigating climate change or adapting to climate change, can be assessed. Key question is: are the plans future-proof? Furthermore scenario results can be used to develop policies and measures. E.g. the Deltacommissie (2008) followed this *inductive* approach for future flood protection. Alternatively, it is possible to assess policies and plans against a set of different scenarios. This is a *deductive* approach.

Inductive approaches aim at preparing for future needs. They are very common in ordinary policy making. However it is not so common to make such plans for time-frames longer than approximately ten years. The inductive approach shares similarities with *backcasting* approaches. These are normative approaches where policies are being designed to reach some desired future. Such a desired future could be e.g. the Netherlands carbon neutral in 2050 or the Netherlands protected to 130 cm sea level rise in 2100. In a backcasting exercise a stepwise approach is designed to meet such a target (Berkhout and Van Drunen, 2007).

Deductive approaches do not start with scenario results but with policy plans. Key question is: what are the implications of the plan in case of different possible futures? For example in many CcSP projects adaptation options will be designed, i.e. measures that repair or prevent negative impacts of climate change. In these projects, the options have been formulated on the basis of an inductive approach with one of the KNMI scenarios as starting point. However they should also be assessed against different socio-economic scenarios by applying a deductive approach.

To summarize: deductive approaches refer to 'society-proofing' climate policies and climate proofing 'normal' policies. Inductive approaches try to sketch what future societies look like. In the latter usually no new policies are taken into account. Many projects involve both inductive and deductive approaches. One of them is the Safety First project, the case study discussed in the next chapter.

4 Case: Water Safety

4.1 Introduction

The research project *Aandacht Voor Veiligheid* (Safety First, AVV) provided inputs for the Deltacommissie (2008) that advised the Dutch Government about flood protection in the coming century. It was funded by Climate changes Spatial Planning, Living with Water and the Ministry of Transport, Public Works and Water Management. Socio-economic (and climate) scenarios played a crucial role in this project. Below the steps taken in this project to set up the socio-economic scenarios are elaborated. See Aerts et al. (2008) for the project's final report.

4.2 Stakeholders, adapting scenarios and the process

The AVV team concluded that the WLO scenarios were probably very useful for their project. At the start of the project they organized a workshop (in conjunction with IC11) to what extent the WLO scenarios needed to be modified or extended among a group of water experts and stakeholders, such as representatives from the Ministry water department, provinces, municipalities, water-related research institutes, universities and consultancy firms. The workshop was moderated by scenario experts from Pantopicon (Antwerp). Three WLO-project members from the three planning bureaus (CPB, MNP and RPB) introduced the WLO-scenarios to the workshop participants, provided clarifications during the discussions and reflected on the workshop outcomes. See Annex I for the workshop's agenda. The workshop participants set up three PMI (Pluses, Minuses, and Interesting issues) matrices about WLO. Main conclusions were that WLO provided a good basis for the scenarios to be used in AVV, but that they wanted to look further into the future (2100) and they wanted to consider more extreme variants of the scenarios (Van Drunen et al., 2007).

The AVV team decided to extend two of the four WLO scenarios, Global Economy and Regional Communities, till 2100. To do so, it used the IPCC SRES and additional demographic scenarios (Van der Hoeven et al., 2007). The team also organized a second workshop with stakeholders to seek for possible solutions for climate change related floods, with 2100 as a time horizon (see Annex I for the workshop agendas).

4.3 Discontinuities

Informed by the first workshop, the AVV project team aimed to adjust the WLO scenarios in two ways:

1. Establish more variation between the scenarios (i.e. more discontinuous scenario plots) by stretching the WLO scenarios in such a way that they fit better to the Dutch (institutional) water context;
2. Include non-linear events and developments (i.e. more discontinuous storylines).

AVV organized four additional workshops:

In two backcasting workshops (Van de Kerkhof et al., 2007) it was identified what activities are required to reach a climate proof Netherlands in 2100.

Figure 3 Maps, graphs and post-it memos were used to help the workshop participants expressing their visions.

The ‘interdisciplinary’ workshop developed discontinuous storylines by identifying and systematically evaluating the direct and indirect effects of extreme events (Van ’t Klooster, 2007b). The participants used maps, clay, paper sheets, post-it memos and marker pens to visualize their insights (Figure 3 and Figure 4).

The ‘governance’ workshop, attended by policymakers and researchers, started with two extreme future perspectives and subsequent water management options to prevent flooding. Key question that was addressed was how to identify the necessary policies, institutional changes, new roles for stakeholders etc. (Van ‘t Klooster et al, 2007).

The workshops generated a long list of possible discontinuities (Aerts et al., 2008:50) and possible implications for water safety in The Netherlands. Based on the evaluation of these discontinuities, the AVV team included the policy option ‘elevation’ in its analysis. This option and three other policy options were evaluated in the extended Regional Communities and Global Economy WLO scenarios (Aerts et al., 2008:128-134).

Figure 4 Determining future images with a map and coloured clay.

4.4 Integrating future thinking

AVV aimed to develop a ‘discussion support system’: the AVV-DOS. The prototype of the AVV-DOS is described in Aerts et al. (2008: Ch.10). ‘Future awareness’ among its users is increased by systematically evaluating water safety policy options against different combinations of climate and socio-economic scenarios. The proposed users’ session involves five steps:

1. The Netherlands in the long term: a combination of socio-economic and climate scenarios;
2. The effects in the ‘do nothing’ option, shown in maps;
3. Solutions: the user selects possible sets of measures;
4. Robustness of solution: an effects table and maps show the robustness of the sets of measures;
5. Moments of investments: here it can be decided where turning points are to be expected, i.e. when it needs to decided to invest or not.

The AVV-DOS challenges the user to ‘play’ with the available information. Hence, he will develop some sensitivity for the key parameters in the system and their implication on the water safety in The Netherlands.

5 Resources

5.1.1 Scenarios

Abbreviation	Full name	Experts	Description
WLO	*Welvaart en Leefomgeving*; The Future of the Dutch Natural and Built Environment	Nico Pieterse Herman Stolwijk Peter van Puijenbroek	Four scenarios for The Netherlands in 2020 and 2040. Generic data about economy, population, land use.
SRES	*Special Report on Emission Scenarios*	Tom Kram	Global greenhouse gas emissions and other socio-economic data until 2100.
Foresight Futures	*Foresight Futures 2020*	Frans Berkhout	A whole series of scenarios for different themes and sectors for the UK, including flood and coastal defence.

5.1.2 Websites

URL	Description
www.climatescenarios.nl	Wiki with key numbers for demography, economy, innovation and spatial developments in 2020, 2040 and 2100 for The Netherlands, Randstad, Transition Zone, Other provinces, EU-15 and the World; based on WLO and CPB data.
http://www.toekomstverkenning.nl	Dutch site with a database of published scenario studies.
http://www.efmn.eu	European Foresight Monitoring Network monitors ongoing and emerging foresight activities.
http://www.adaptation.nl/avv	Everything about the Safety First project (Chapter 4)

5.1.3 Research projects CcSP

Abbreviation	Full name	Contact	Description
IC11	Socio-economic scenarios for climate assessments	Michiel van Drunen	Making socio-economic scenarios available for CcSP researchers.
IC3	LANDS - Landgebruiksontwikkelingen in een veranderend klimaat	Eric Koomen	Spatial developments resulting of climate change. Extensive use of the Land Use Scanner.
A13	Aandacht voor Veiligheid	Jeroen Aerts	Impacts of long-term changes in climate and land use on water security.

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Annex I Aandacht Voor Veiligheid

Agenda AVV workshop: 'Stakeholders'.

12.30 uur	Ontvangst
13.00 uur	Introductie van de workshop (Frans Berkhout) Presentatie ICII-project (Frans Berkhout) Presentatie AVV-project (Jeroen Aerts)
13.15 uur	Interactieve presentatie: De WLO-scenario's in een notendop (Herman Stolwijk & Peter van Puijenbroek)
14.00 uur	Oefening: Beleef de WLO-scenario's
14.30 uur	Werkateliers: De WLO-scenario's onder de loep
16.30 uur	Plenaire synthese: Bruikbaarheid van de WLO-scenario's
1715 uur	Afsluiting

Agenda AVV workshop: 'Perspectives'.

13.00 uur	Opening van de workshop
13.10 uur	Introductie: Aanpak van de workshop
13.20 uur	Inspiratie injecties: drie perspectieven op waterbeheer
14.15 uur	Werkatelier 01: brainstorm mogelijke oplossingsrichtingen
15.30 uur	Werkatelier 02: selectie van meest interessante oplossingsrichtingen
15.40 uur	Pauze
15.45 uur	Werkatelier 03: verdiepen van oplossingsrichtingen
16.30 uur	Werkatelier 04: samenvatten van de inzichten in een beknopte boodschap en opnames
17.00 uur	Terugkoppeling van inzichten en gezamenlijke synthese
17.30 uur	Afsluiting

Agenda AVV workshop: 'Discontinuities'

12.30 uur	Opening van de workshop en inleiding AVV
12.45 uur	Introductie - discontinuïteiten: wat verstaan we daar onder?
13.10 uur	Opwarmer: door de tijd
13.30 uur	Werkatelier 01: brainstorm discontinuïteiten in-zicht
14.10 uur	Werkatelier 02: inspiratie-injecties en nieuwe brainstorm
14.30 uur	Pauze
15.45 uur	Werkatelier 03: eerste verkenning en selectie discontinuïteiten
15.15 uur	Werkatelier 04: analyse discontinuïteiten
16.15 uur	Terugkoppeling: de minister aan het woord
17.00 uur	Afsluiting

Agenda AVV workshop: 'Governance'

13.00 uur	Inloop met broodjes
13.30 uur	Opening van de workshop en inleiding AVV
13.50 uur	Introductie: aanpak van de workshop
14.00 uur	Gezamenlijke verkenning: sturing in een klimaatbestendig Nederland (werksessie)
16.00 uur	Debat meest vernieuwende ideeën
16.50 uur	Hoe verder
17.00 uur	Afsluiting