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SCENES

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Deliverable 2.10

**Pan-European backcasting exercise, enriched with regional perspective,
and including a list of short-term policy options**

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SCENES

Water Scenarios for Europe and for Neighbouring States

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Deliverable 2.10
(WorkPackage 2, scenarios)

Pan-European backcasting exercise, enriched with regional perspective, and including a list of short-term policy options

Kasper Kok¹, Mathijs van Vliet¹, Iona Bärlund², Jan Sendzimir³, Anna Dubel³

1: Department of Environmental Sciences, Wageningen University, Wageningen, the Netherlands

2: Center for Environmental Systems Research, Kassel, Germany

3: IIASA, Laxenburg, Vienna, Austria



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Table of Content

| | | |
|-------|---|----|
| 1 | Introduction | 5 |
| 1.1 | An introduction to the reader | 5 |
| 2 | From the second to the third PEP workshop..... | 5 |
| 2.1 | Completion and approval of final draft of storylines (online) | 6 |
| 2.1.1 | <i>ResearchGATE</i> | 6 |
| 2.1.2 | <i>Email discussion</i> | 7 |
| 2.2 | PEP3 preparatory meeting | 7 |
| 2.3 | Red Threads | 8 |
| 2.3.1 | <i>Economy First - Red Thread</i> | 8 |
| 2.3.2 | <i>Fortress Europe - Red Thread</i> | 10 |
| 2.3.3 | <i>Policy Rules - Red Thread</i> | 13 |
| 2.3.4 | <i>Sustainability Eventually - Red Thread</i> | 15 |
| 2.4 | Agenda for PEP3 | 18 |
| 3 | PEP3 Method and Process | 19 |
| 3.1 | Workshop facilitation | 19 |
| 3.2 | Workshop method - backcasting | 19 |
| 4 | Results of the backcasting exercise..... | 20 |
| 4.1 | Desired objective in 2050 | 20 |
| 4.2 | Sustainability Eventually - backcasting results..... | 21 |
| 4.2.1 | <i>Backcast - overview timeline</i> | 21 |
| 4.2.2 | <i>Endpoint</i> | 22 |
| 4.2.3 | <i>Five highways</i> | 22 |
| 4.2.4 | <i>Obstacles and opportunities</i> | 22 |
| 4.2.5 | <i>Milestones</i> | 23 |
| 4.2.6 | <i>Actions</i> | 25 |
| 4.2.7 | <i>Summary</i> | 26 |
| 4.3 | Fortress Europe - backcasting results | 29 |
| 4.3.1 | <i>Backcast - overview timeline</i> | 29 |
| | <i>Endpoint</i> | 30 |
| 4.3.2 | <i>Obstacles and opportunities</i> | 30 |
| 4.3.3 | | 30 |
| 4.3.4 | <i>Milestones</i> | 30 |
| 4.3.5 | <i>Actions</i> | 32 |
| 4.3.6 | <i>Summary</i> | 33 |
| 4.4 | Economy First - backcasting results..... | 36 |
| 4.4.1 | <i>Backcast - overview timeline</i> | 36 |
| 4.4.2 | <i>Endpoint</i> | 37 |
| 4.4.3 | <i>Obstacles and Opportunities</i> | 37 |
| 4.4.4 | <i>Milestones</i> | 39 |
| 4.4.5 | <i>Actions</i> | 40 |
| 4.4.6 | <i>Strategies</i> | 40 |
| 4.4.7 | <i>Strategies in detail</i> | 41 |
| 4.4.8 | <i>Summary</i> | 44 |
| 4.5 | Policy Rules - backcasting results | 46 |
| 4.5.1 | <i>Backcast - overview timeline</i> | 46 |
| 4.5.2 | <i>Endpoint</i> | 47 |
| 4.5.3 | <i>Opportunities and Obstacles</i> | 48 |
| 4.5.4 | <i>Milestones</i> | 49 |
| 4.5.5 | <i>Actions</i> | 50 |
| 4.5.6 | <i>Summary</i> | 51 |

| | | |
|-------|--|-----|
| 4.6 | Comparing the four backcasting exercises (SCENES Scenario Team) | 52 |
| 4.6.1 | <i>Endpoints</i> | 52 |
| 4.6.2 | <i>Backcasting strategies</i> | 52 |
| 4.6.3 | <i>Key milestones and actions</i> | 53 |
| 4.6.4 | <i>Key obstacles and opportunities</i> | 54 |
| 4.6.5 | <i>Candidates for robustness</i> | 54 |
| 4.7 | Summary and comparison of backcasts (PEP members) | 55 |
| 4.7.1 | <i>How do strategies in one scenario fare in others?</i> | 55 |
| 4.7.2 | <i>Robust strategies</i> | 57 |
| 4.7.3 | <i>Candidates for robust actions identified by PEP members</i> | 57 |
| 4.8 | Final list of robust elements emerging from backcasting exercises | 58 |
| 5 | Pilot Area and regional enrichment - results from the IA2 meeting | 60 |
| 5.1 | Methodological considerations | 60 |
| 5.2 | Mediterranean region | 60 |
| 5.2.1 | <i>Step 1. Cross-scale comparison of Pilot Area backcasting exercises</i> | 60 |
| 5.2.2 | <i>Step 2. Enrichment of PEP3 backcasting results</i> | 64 |
| 5.3 | Baltic region | 72 |
| 5.3.1 | <i>Step 1. Cross-scale comparison of Pilot Area backcasting exercises</i> | 72 |
| 5.3.2 | <i>Step 2. Enrichment of PEP3 backcasting results</i> | 72 |
| 5.4 | Black Sea region | 77 |
| 5.4.1 | <i>Step 1a. Cross-scale comparison of Pilot Area backcasting exercises</i> | 77 |
| 5.4.2 | <i>Step 1b. Towards a regional vision</i> | 81 |
| 5.4.3 | <i>Step 2. Enrichment of PEP3 backcasting results</i> | 85 |
| 5.5 | Lower Danube region | 89 |
| 5.5.1 | <i>Step 1. Cross-scale comparison of Pilot Area and local backcasts within the Lower Tisza</i> | 90 |
| 5.6 | Summary of findings | 93 |
| 5.6.1 | <i>Comparison and enrichment by backcast/scenario</i> | 93 |
| 5.6.2 | <i>Endpoints</i> | 94 |
| 5.6.3 | <i>Obstacles and opportunities</i> | 95 |
| 5.6.4 | <i>Robust key actions and key milestones</i> | 96 |
| 6 | Conclusions | 98 |
| 6.1 | Red Threads | 98 |
| 6.2 | PEP3 - backcasting exercise | 98 |
| 6.3 | Conclusions on regional enrichment | 99 |
| 6.4 | Overall conclusions | 99 |
| 7 | References | 100 |

1 Introduction

Author: Kasper Kok

This Deliverable has two main parts. First, it reports on the results of the third and final pan-European stakeholder meeting (pan-European panel, PEP3) as it took place 20-22 January 2010 in Paris, France. Secondly, these results were enriched with a Pilot Area and regional perspective during a meeting of all Pilot Area representatives (IA2 meeting) 12-14 April in Tallinn, Estonia. The third series of workshops at all levels used a backcasting methodology to arrive to a set of long-term strategies and short-term (policy) actions satisfy a desired endpoint. In order to allow regional teams of SCENES sufficient time to finalise their evaluation of the PEP results, submission of this Deliverable was about 2 months delayed. This Deliverable thus contains the results of the backcasting exercise of PEP3. For results of the third series of Pilot Area workshops, on which the enrichment was partly based, we refer to Deliverable IA2.4. Deliverable 2.11 furthermore presents a meta-analysis of the backcasting exercises at Pilot Area level. Note that this Deliverable does not contain a final version of the storylines, but focuses only on the backcasting methods and results. For the storylines we refer to Deliverable 2.6; where necessary the latest versions will be part of Deliverable 2.12.

1.1 *An introduction to the reader*

This Deliverable is meant in first instance as a means to document the multitude of results coming out of two important meetings (PEP3 and IA2 in Tallinn), as well as a documentation of intermediate products that grew in importance during the course of last year, importantly the Red Threads. Due to the nature of the results, a large number of authors have been involved, which in turn has resulted in a mix of styles. Additionally, most of the material is rather unconsolidated. Presenting the raw material was on purpose to avoid interpretational errors. The drawback is that large parts of this Deliverable contain many tables, figures, or graphs. This makes the document difficult to read. I have indicated the main author or responsible person at the start of each main chapter. For more information on any chapter, I refer to the person mentioned there. Additionally, below is an indication of those sections that attempt to summarise, and that therefore contain the main elements of this Deliverable:

| | |
|--|---------------|
| Online discussion with PEP stakeholders: | Section 2.1.1 |
| Summaries of qualitative scenarios – Red Threads | Section 2.2 |
| Backcasting method | Section 3.2 |
| Analysis of PEP3 backcasting exercise | Section 4.6 |
| Summary of findings by PEP3 members | Section 4.7 |
| Final list of robust candidates | Section 4.8 |
| Summary of regional enrichment | Section 5.5 |
| Conclusions | Section 6 |

2 From the second to the third PEP workshop

Author: Kasper Kok

As between PEP1 and PEP2, a number of important steps were undertaken between PEP2 and PEP3 to ensure both a continued involvement of (part of) the pan-European stakeholders in the process and a stakeholder-driven completion of a number of essential products before the start of PEP3. The main steps are shortly discussed below.

2.1 Completion and approval of final draft of storylines (online)

As explained in Deliverable 2.6, the finalisation of the SCENES storylines was delayed, most importantly because of the detailed and intensive discussions that took place during PEP2. We used a number of additional (digital) tools to complete the storylines through a discussion with the PEP members. We largely followed the roadmap as presented in Deliverable 2.6. Important elements were:

2.1.1 ResearchGATE

ResearchGATE (<http://www.researchgate.net>) is a tool that allows for an online discussion between many people, sharing files and other types of information. It was used in August-September 2009 and it allowed a broad participation of PEP members in providing further details to the storyline drafts. The results were satisfying, but mixed.

After detailed discussion between representatives from WP2 and WP3 we created a ‘discussion board’ with nine topics that we invited participants to provide us with more information on. Topics; main reason to include them; and a general conclusion on the reactions that we received are listed in Table 1.

Table 1. Discussion topics formulated in ResearchGATE, reason for including it, and main conclusion of feedback received.

| Discussion topic | Reason for including | Conclusion |
|--|--|--|
| Water Framework Directive and other policies | Following the original Focus Question 2 on the WFD (see Deliverable 2.6), we asked for more policy-relevant information for all storylines | Relatively vivid discussion involving several PEP members yielded good comments for various storylines |
| Demographics | Population growth and migration is one of the key drivers of the WaterGAP model, while information in the storylines was somewhat ‘vague’. | Some concrete remarks, but insufficient to answer all outstanding questions from WP3. |
| Economics | Mainly included because of the lack of economic information in the Economy First storyline | Concrete remarks from one PEP member concerning the Economy First storyline |
| Technological Development | Mainly included to discuss some inconsistencies between information in storylines and numbers obtained from Fuzzy Sets (see Deliverable 2.6) | Concrete remarks from one PEP member concerning Economy First only. Inconsistencies unresolved. |
| Water Quality | Following the original Focus Question 2 on water quality, we asked for more concrete information for all storylines | Concrete remarks from one PEP member concerning Economy First only. Additional information meagre. |
| European extension | None of the storylines deal specifically with how much the EU will expand, particularly related to Ukraine, Turkey, Balkan. | No information was provided |
| Northern Africa | None of the storylines deal specifically with development in Northern Africa. We targeted one stakeholder to answer this question. | Stakeholder did not use ResearchGATE |
| Western Asia | None of the storylines deal specifically with development in Northern Africa. We targeted one stakeholder to answer this question. | Stakeholder did not use ResearchGATE |

| | | |
|--------------------------------|--|-----------------------------|
| Regionally enriched storylines | One of the central aims of PEP2 that was not addressed exhaustively. Including here to obtain more regionally specific information | No information was provided |
|--------------------------------|--|-----------------------------|

It is clear from Table 1, that the ResearchGATE tool helped us to a very limited extent only to finalise the storylines and complete missing information. We were relatively successful with topics such as the WFD, demographics, and economics, but totally unsuccessful particularly with topics related to specific regions, either in general or when specifically targeting a region and/or a stakeholder. There are various reasons for the rather poor success with using ResearchGATE:

1. **ResearchGATE tool too complicated to use.** Participants needed to register, navigate to the SCENES group page, and understand the logic of Discussion board, topics, and comments. Although we explained the procedure in detail, several PEP members perceived the site as being “complicated” and the process to understand as time consuming.
2. **Time interval between last PEP meeting (October 2008) and online discussion was too large.** Several PEP members commented that they were unsure of the content of the storyline that they helped creating. Re-reading and understanding a storyline was, again, overly time consuming.
3. **Discussion topics were too general.** It seemed that the general character of some of the discussion topics was not inviting to discuss further. However, we dismissed the idea of posting more challenging and/or detailed topics as this would have influenced stakeholders’ opinion and lead to potentially subjective contributions.
4. **PEP members of some storylines were satisfied with the results obtained in PEP2.** Most of the discussion took place on the Economy First storyline, which was clearly the narrative on which most discussion needed to take place. Particularly Policy Rules was heavily discussed immediately after the PEP2, leading to a product on which there was widespread consensus and more detail. The same was true to some extent for Sustainability Eventually and Fortress Europe.
5. **Lack of time of PEP members to participate in between PEP workshops.** Some PEP members indicated that an active participation of 3x3 days was the maximum they could afford.

However, some progress with some PEP members was made, and if anything the initiative refreshed the minds of the stakeholders and initial discussions renewed interest for the process and willingness to further collaborate in the process of finalisation of storylines. We therefore concluded that despite the somewhat unsatisfactory results of using ResearchGATE, there was potential for a follow-up, using a simpler tool with more targeted questions for a subset of stakeholders.

2.1.2 Email discussion

We initiated a discussion on all four storylines through Email. The four storyline editors selected 1-2 PEP members that were active during PEP2 on that storyline and asked them to answer a few of the most pressing questions regarding their storyline. The Email discussion took place in November-December 2009. Particularly in the case of Economy First and Fortress Europe, the digital discussion was rather extensive. The most important aspect of this online consultation, however, was to ask approval off all PEP members on a version of the storylines that could be considered the ‘final’ product and that as such could be used as input into the backcasting exercise without further discussions during that meeting on the content of the storylines. Approval was given to all storylines.

2.2 PEP3 preparatory meeting

A two-day meeting was held with representatives of WP1-5 in Wageningen 16-17 September 2009, thus shortly after the ResearchGATE discussion but before the subsequent Email discussion. Similar to earlier PEP meetings,

the main goal was to set the agenda for PEP3. Based on the experiences during PEP2, a key conclusion was drawn early in the meeting:

We were overambitious during PEP2 overloading the stakeholders with objectives and information. PEP3 needs to be more modest in its design focusing on 1-2 issues only and completely omitting others.

This quickly led to the following main conclusions for PEP3

1. There is a need to finalise one more round of Story-And-Simulation. This entailed reserving one day of the meeting for a discussion of drivers, WaterGAP model output, and indicators.
2. The key objective of the meeting needs to be a backcasting exercise. This translated into reserving the remaining 2 days entirely to executing the backcasting exercise.
3. Although essential to SCENES, there is no space to undertake a cross-scale enrichment exercise. It was decided that regional coordinators, as before, would be invited to the meeting, but without making cross-scale enrichment part of the programme.
4. Likewise there is no space to discuss details of the storylines. This led to the conclusion that it would be better to present a summary of the storylines rather than to full detail of the narratives. These were termed 'Red Threads' and are presented in Section 2.3.

2.3 Red Threads

During the PEP3 preparatory meeting it was decided to develop summaries of the four storylines in order to minimise chances that details would be discussed during PEP3, while at the same time maximising the use of the storylines. To further enhance the usability, we opted for summaries using three means of communication: words; a flow-chart; and pictures. Below the Red Threads of all four scenarios are given:

2.3.1 Economy First - Red Thread

Authors: Ilona Bärlund and Anna Dubel

The economy develops towards globalisation and liberalisation so innovations spread but income inequality, immigration and urban sprawl cause social tensions. All energy production alternatives are considered, international consortia are financed to find high-tech alternatives to fossil fuels. Global demand for food and biofuels drives the intensification of agriculture with increasing need for irrigation and new cultivation area. As CAP is weakened farms are abandoned where crop production is uneconomic. Slow adoption of water-efficient technologies due to peoples' limited income, low water-saving consciousness, more single-person households, increase in tourism and lack in training using new irrigation technologies lead to higher water use. Only the higher water prices dampen this trend. It is economic to treat and re-use irrigation return flows thus this practice also reducing diffuse pollution is adopted. Water ecosystems providing ecological goods and services for economies and society (e.g. tourism) are preserved and improved. Thus WFD changes its conceptual focus from the good ecological status to preserving socio-economically worth ecological services. Pollution load increases due to curtailed infrastructure, poor treatment and intensified agriculture. Poisoning incidents catch the interest of media and public. Scientific findings and public protests are being finally heard. Even if governments and European institutions are weak in EcF they are the last straw after recession and social upheaval in 2040s to start working with NGOs, industries and other representatives of civil society to restore economic prosperity and make ground for social coherence.

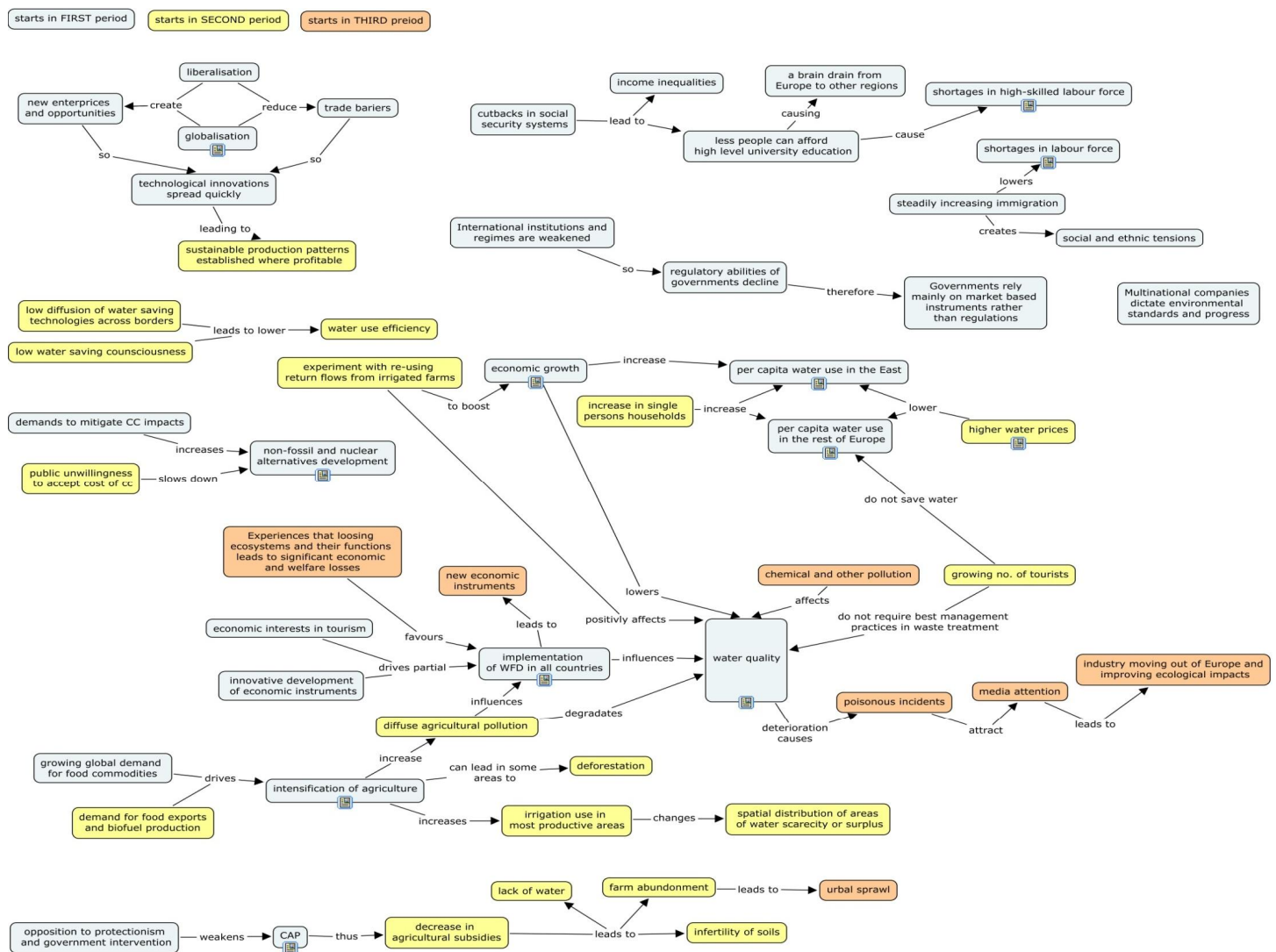


Figure 1. Flow-chart as part of the Economy First Red Thread

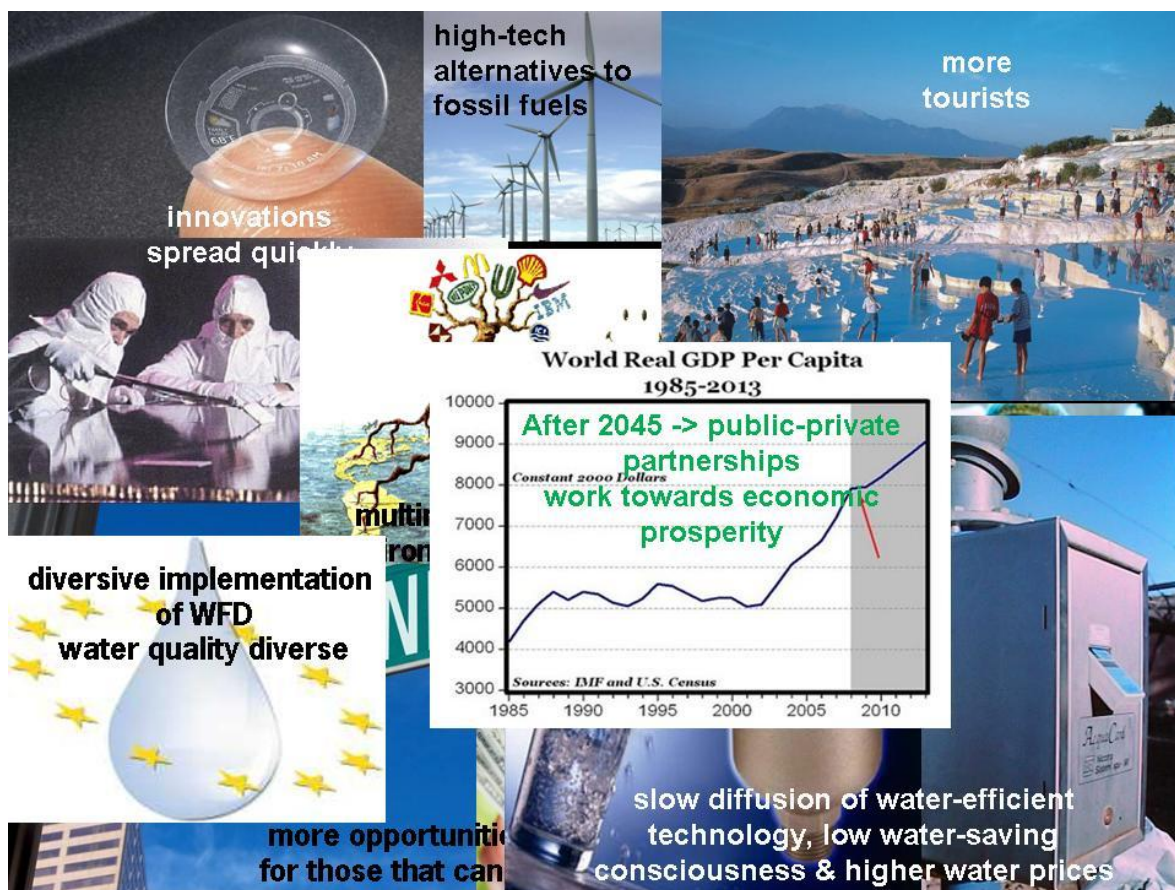


Figure 2. Collage of images as part of the Economy First Red Thread.

2.3.2 Fortress Europe - Red Thread

Author: Mathijs van Vliet

The world becomes increasingly unstable due to crises, such as energy, financial and climate crises. This causes unstable situations, for instance in the Middle East and an increase in terrorism. This causes an increase in resource prices and increases the (perceived) need for more security. Europe starts closing its border and concentrates on common security issues. EU-side policies become more protective, and focus more and more on security issues like food and energy independence. Increasingly this aim for self-sufficiency spreads over all sectors. Protective measures are taken, but the internal EU market remains very open. This increases the market for EU produced goods. The consequence of the internal market growth and the desire to be self-sufficient is an increasing exploitation of domestic natural resources. Although all cooperation is difficult in this increasingly unstable world, (perceived) threats from outside keep the EU together. The need for cooperation and mutual protection strengthens the EU and in time leads to a further integration. The strength of the EU makes it possible to solve (internal) conflicts. The increasing gap between world regions causes an increasing migration pressure on the EU. This is neutralised by an increase in funding for Frontex, which is turned into a real border police. As the EU institutions become stronger existing policies are more and more re-evaluated to address security issues and new EU-wide policies are implemented. Resources are strictly managed and environmental consequences get lower attention. Good examples are the Water Security Framework and Secure Agriculture Policy. Innovations are shared only within the EU, which increases the reliance on outdated technologies, especially in the first and second period. This causes large environmental losses and a loss in biodiversity. The increasing internal market causes the cost of resources to increase, which leads to stabilising GDPs and eventually to a switch to more efficient techniques. In the end these techniques, together with a need to be much more resource efficient, lower the environmental losses, but the net result remains negative. In the end of the second and third period Climate Change becomes a problem. It leads to EU internal migration, water shortages

and conflicts. Conflicts are solved by the strong EU institution and because countries do not want to be put out of the EU. It also leads to conflicts between resources rich and poor countries, which results in a further increase in the gap between world regions. Immigration pressure builds up, but is largely neutralised by Frontex which is turned into a real border police.



Figure 4. Collage of images as part of the Fortress Europe Red Thread.

2.3.3 Policy Rules - Red Thread

Author: Jan Sendzimir

- Stronger coordination of policies at EU level, but policies become slowly more ineffective
- Ecosystem services begin to deteriorate very significantly
- Until 2030, EC is increasingly disappointed in level of WFD compliance; issues of water quality/quantity generally ignored
- There are emerging and increasing pressures on water resources
- After 2030, climate change hits hard -> changes public apathy
- Leads to WFD compliance that is higher than ever
- By 2030 public participation is increased -> local government support
- By 2050, Europe at forefront of a new socio-economic paradigm of public/private partnerships -> leads a global shift in this direction

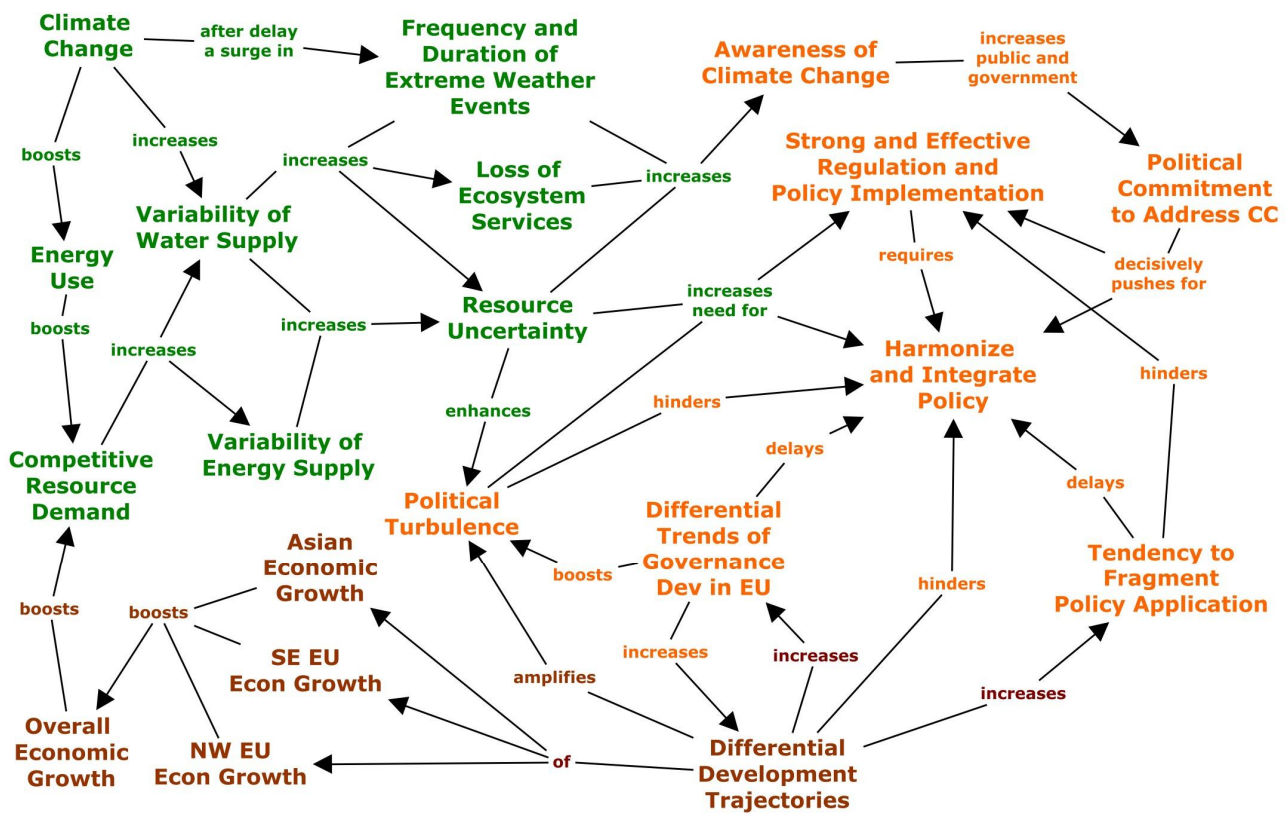


Figure 5 and Figure 6. Flow-chart and collage of images as part of the Policy Rules Red Thread.

2.3.4 Sustainability Eventually - Red Thread

Author: Kasper Kok

Main long-term changes (2050)

- Transition towards environmental sustainability
- Local initiatives leading – local diversity
- Landscape is the basic unit
- Focus on quality of life

Main factors

- First, strong top-down measures (“quick change”)
- Later accompanied by behavioural change and governance structure (“slow change”)
- Kick-started by a series of extreme events
- Water pricing system (PPP) is key in regulating water demand
- Economic recession, later deemed less essential for quality of life
- Decrease in consumer demand (water, food)
- Split water poor and water rich countries
- Strong internal migration
- Increase water quality; decrease water stress

Beginning (2008-2015)

- Disasters hit hard (recession, environmental, peak oil, drought, flooding)
- EU is divided and ‘greening’ starts
- Consumer distrust in EU and current politics
- Migration flow intensifies (from Western Europe to the Mediterranean)
- Lack of alternatives leads to general acceptance of consequences
- Top-down measures implemented
- Education, training, and planning initiated
- Spatial planning becomes more central
- WFD is updated with stronger water-pricing mechanisms
- Alignment of water-poor countries
- Investments in water saving technologies
- Behavioural change is very slow and effects not noticeable

Middle (2015-2025)

- Crucial for transition to regionally governed society
- Bottom-up slow; top-down fast and effective; behaviour changes very slowly
- Trust-based networks formed (linking NGOs and national government)
- Widespread acceptance of PPP
- Strong development of water-saving technologies
- By 2025, water demand stabilises; slow measures start showing results
- Transition is painful, slow, and not successful everywhere
- Water poor: strong alliances; water governance structure emerges
- Water rich: strong resistance and perseverance old structures

End (2025-2050)

- (local) Trust-based networks have become leading
- Behavioural changes become apparent; consumption patterns change
- EU continues to exist, fostering and stimulating local action
- There are strong regional differences
- Water poor: mix of behaviour, technology, and policies is successful
- Water rich: governance more successful but continues to lag behind

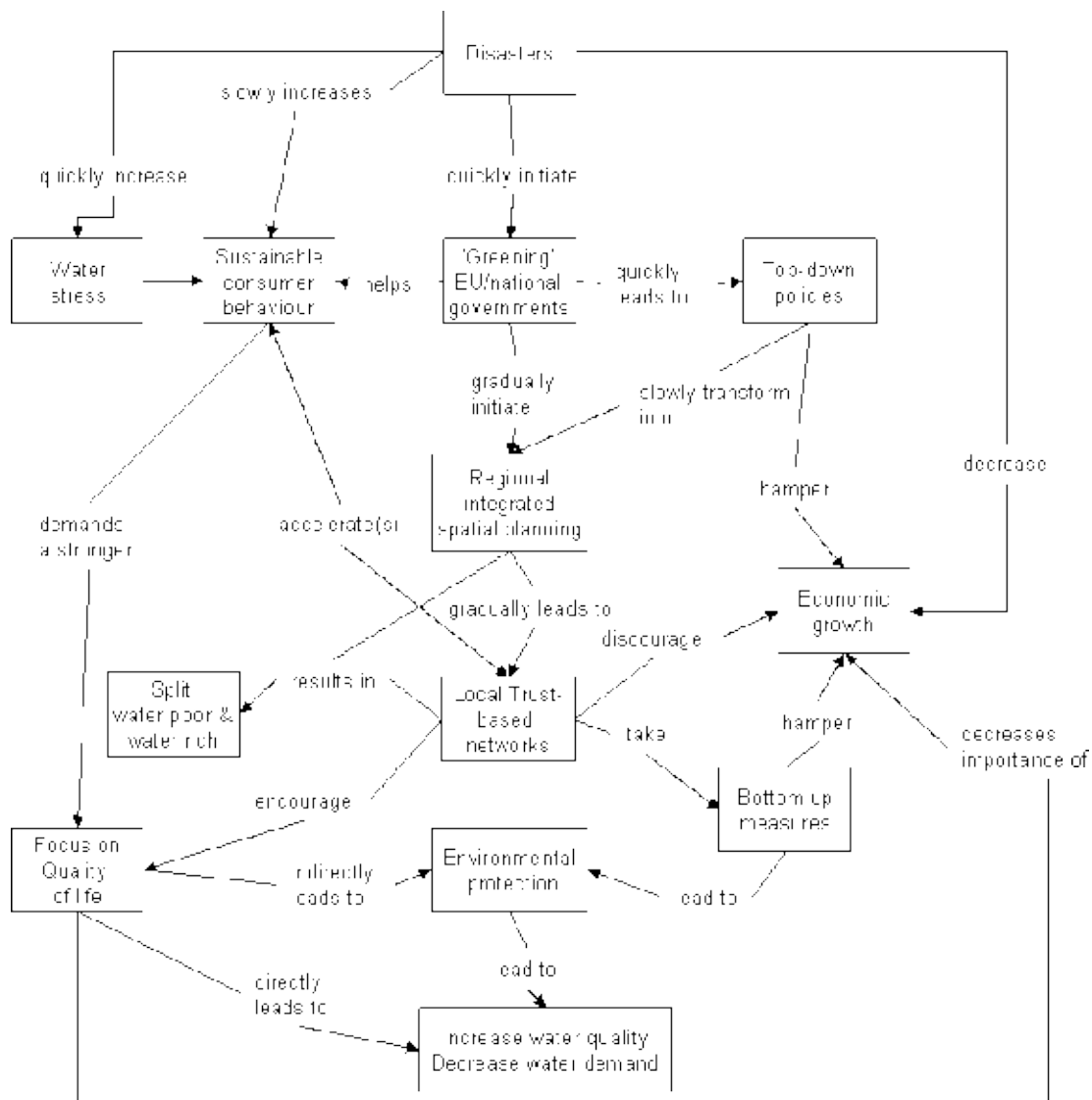


Figure 7. Flow-chart as part of the Sustainability Eventually Red Thread.

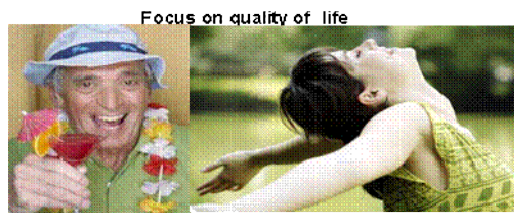
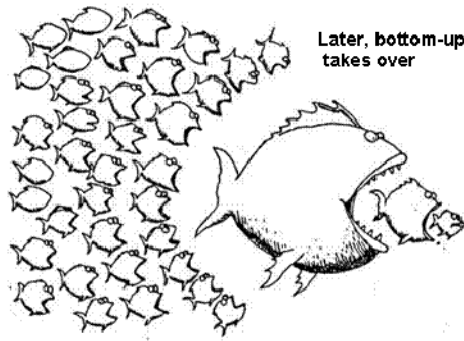


Figure 8. Collage of images as part of the Sustainability Eventually Red Thread.

2.4 *Agenda for PEP3*

The following agenda was drafted for the third meeting of the pan-European Scenario Panel (PEP3). It was based on a first draft developed during the PEP3 preparatory meeting and an second meeting in December 2009 with Marc Gramberger, the workshop's facilitator.

Wednesday, 20 January 2010

| | |
|---------------|--|
| 13:00 – 13:45 | Welcome and introduction |
| 13:45 – 14:15 | Overview of work done up to now (PEP1 and PEP2) |
| 14:15 – 15:00 | Storyline review and introduction in scenario groups |
| 15:00 – 15:30 | Break |
| 15:30 – 16:00 | Quantification of the scenarios |
| 16:00 – 17:45 | Review of quantification in scenario groups |
| 17:45 – 18:00 | Plenary discussion |
| 19:30 | Dinner |

Thursday, 21 January 2010

| | |
|---------------|--|
| 08:30 – 08:40 | Introduction to day 2 |
| 08:40 – 09:10 | Recap of final storylines using Red Threads |
| 09:10 – 09:40 | Introduction to backcasting exercise |
| 09:40 – 10:30 | Backcasting exercise – Defining the end point in plenary |
| 10:30 – 11:00 | Break |
| 11:00 – 12:15 | Backcasting exercise – Obstacles and opportunities in groups |
| 12:15 – 14:00 | Lunch |
| 14:00 – 15:30 | Backcasting exercise – Milestones in groups |
| 15:30 – 16:00 | Break |
| 16:00 – 18:00 | Backcasting exercise – Actions and building strategies |
| 18:15 – | Reception with French scientists |
| 20:00 | Dinner |

Friday, 22 January 2010

| | |
|---------------|-------------------------------------|
| 08:30 – 08:40 | Introduction to day 3 |
| 08:40 – 10:15 | Plenary presentation and discussion |
| 10:15 – 10:45 | Break |
| 10:45 – 12:15 | Review of strategies per scenario |
| 12:15 – 13:45 | Lunch |
| 13:45 – 15:30 | Next steps: how to use the results |
| 15:30 – 16:00 | Workshop feedback |
| 16:00 | End of workshop |

3 PEP3 Method and Process

Author: Kasper Kok

3.1 Workshop facilitation

As before, the facilitation of the workshop was sub-contracted and executed by Dr. Marc Gramberger from PROSPEX, an internationally active and networked consulting and training company with its base near Brussels, Belgium (www.prospex.com). A number of meetings took place between representatives of SCENES and Marc Gramberger to agree on the methodology for developing the storylines of the Pan-European scenarios.

3.2 Workshop method - backcasting

As said, executing a backcasting exercise was the key objective of PEP3. The method that was followed was identical to the method followed in the third workshop at the Pilot Area and regional level. Below is a short explanation of the backcasting exercise. For more details we refer to Deliverable 2.11, which also contains a meta analysis of the Pilot Area workshops.

Backcasting involves working backwards from a particular desired future end-point to the present, in order to determine the physical feasibility of that future and the policy measures that would be required to reach that point (Robinson, 2003). Quist and Vergragt (2003) describe five steps that effectively capture the overall methodology of the SCENES project as well: 1. Problem orientation; 2. develop future visions; 3. backcasting; 4-5: defining action agenda and implementation. The methods used in PEP3 are in broad outlines similar to a 'standard' backcasting exercise (see e.g. Dreborg, 1996; Quist and Vergragt, 2003). The key underlying notion of including a backcasting in the overall methodology is to complement qualitative storylines with short-term (policy) actions and concrete robust strategies that would need to be implemented to realise a certain desired endpoint. In PEP3, the following steps were discerned:

1. Desired objective in 2050

In a plenary decide on the desired objective that you want to discuss in detail. In groups, the objective can be slightly modified to better fit with the logic of the storyline.

2. Obstacles and opportunities

In groups, PEP members discuss what obstacles and opportunities arise from the storyline that is being used as a context in which the desired objective should be reached.

3. Milestones

In groups, PEP members discuss what intermediate milestones need to be reached in order to reach the desired objectives. Milestones can also give rise to additional obstacles and opportunities. Specific questions to ask are: what is the milestone? When does it need to be reached? Why are they needed?

4. Actions

In groups, PEP members discuss what (policy) actions are needed to reach milestones; overcome obstacles; and/or make use of opportunities. Actions need to be as specific as possible including information on Why, How, When, How long, What, and Who?

5. Towards strategies - Highways of actions/milestones

In groups, PEP members discuss what connected strands of actions/milestones can be identified. These are labelled as 'highways' or main strategies.

6. Robust actions and strategies

In a plenary solutions and actions needed are compared. Are there similarities, actions that need to be taken in most (if not all) scenarios? These are robust actions that should be disseminated further. Also interesting are actions that are very specific to a certain future and that would almost certainly fail in other scenarios?

The main outputs of a backcasting exercise are thus:

- A timeline with milestones, opportunities, obstacles, actions, and strategies needed to reach a certain objective in 2050, specific for a certain scenario
- A list of robust actions and strategies, independent from the scenarios

4 Results of the backcasting exercise

authors: various

4.1 *Desired objective in 2050*

author: Kasper Kok

As a starting point, the following desired endpoint for 2050 was formulated by the SCENES Scenario Team:

“Sustainable management, supply and use of water”

There was a widespread acceptance of the desired objective as posed by the Scenario Team, understanding that it entails both water supply and water demand, while emphasising sustainable development.

Subsequently in plenary, PEP members offered the following specifications:

- o Improved quality & quantity
- o Sufficient for the desired uses
- o Sustainable use
- o No flood damage
- o No droughts => reformulated: Little impact of droughts
- o Restoration of natural environments / habitats
- o Efficient water use
- o Cheap or free water => reformulated: True costs of water, low
- o Equitable access to water

In short, there was agreement that water demand can be translated to ‘sufficient water availability for desired uses’, thus emphasising that trade-offs needs to be made and stating that the endpoint should be specify sectors that have preference. Besides, stakeholders emphasised the importance of flooding and droughts; and issues of equity and efficiency.

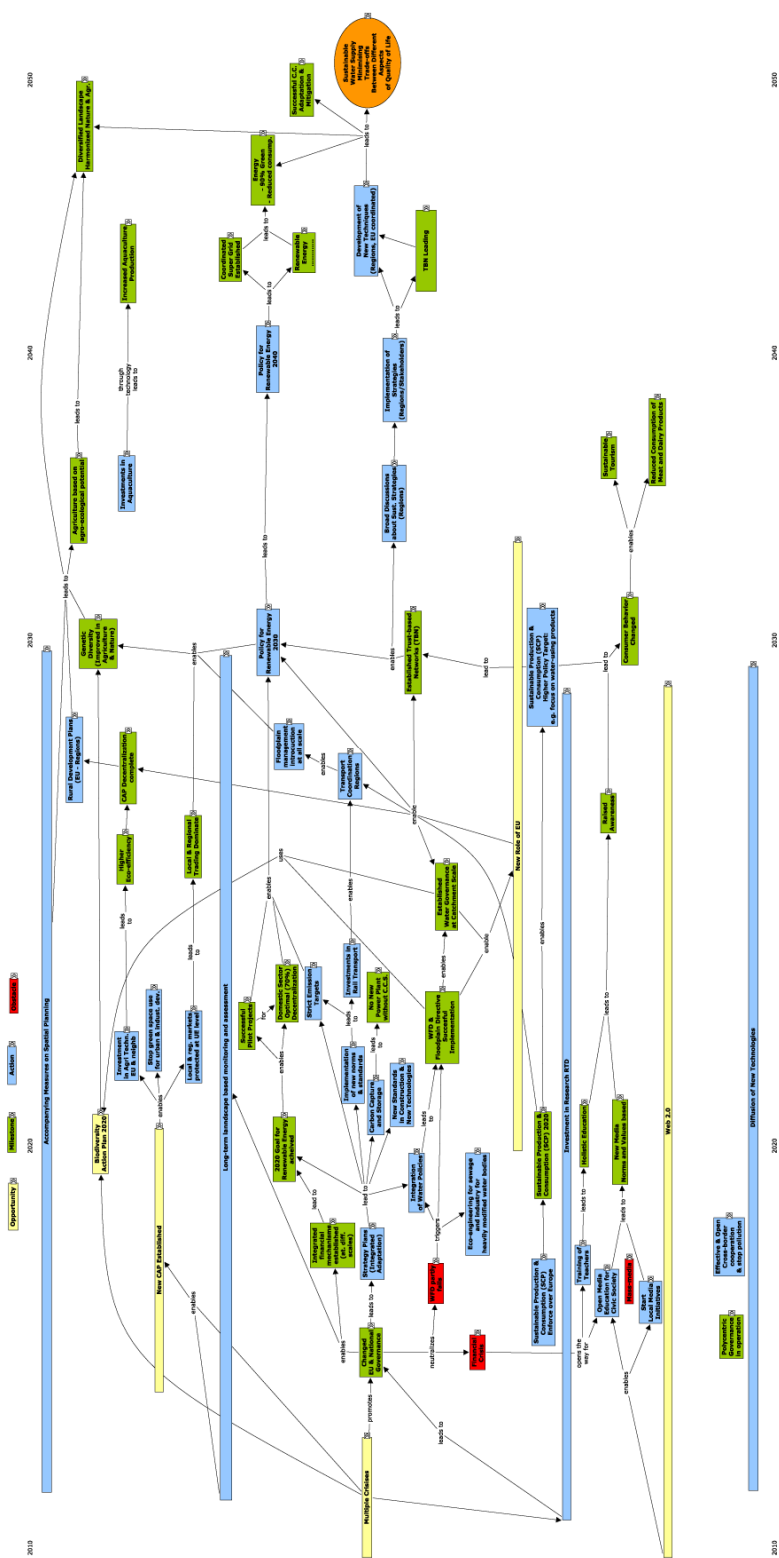
Below are the main results emerging from the four group discussions that took place during day 2 of the meeting.

4.2 Sustainability Eventually - backcasting results

Editor: Kasper Kok

4.2.1 Backcast - overview timeline

Figure 9. Main result of the backcasting exercise of Sustainability Eventually.



4.2.2 Endpoint

After some discussion, the following endpoint was agreed upon:

“Sustainable water supply minimising trade-offs between different aspects of quality of life”.

An important specification is that quality of life is the main focus of Sustainability Eventually, and that it is therefore desirable that sustainable water supply is accompanied with efforts to maximise quality of life. Thus, the context of the storyline that is build around quality of life was viewed as more important than the aspect of water. Note that with ‘water supply’ both water quality and water quantity are covered, as lowering water quality will negatively influence water availability.

Remarks

The backcasting exercise was set up from the beginning according to a number of ‘highways’ of actions. During the course of the exercise three main points in time were identified as crucial: 2015, 2020, and 2030. These are points in time where for most of the highways key milestones and/or actions need to be completed. The remainder of the exercise is structured along the five highways and four time periods. Note that these time periods more or less overlap with the periods identified in the storylines.

The backcasting exercise ended up not being specific for water poor and water rich regions. It was originally intended to construct two backcasts, but for several reasons the divide did not materialise. Firstly, because many milestones and actions proved to be sufficiently generic for both water poor and water rich regions. Secondly, some of the actions are more relevant for one of the two regions, the overall exercise thus representing both regions. And finally, lack of time forced the decision to focus on general actions that would be needed for the whole of Europe. Note that all highways are sufficiently generic to be of importance to both regions.

4.2.3 Five highways

The group decided to formulate a number of highways of action or strategies beforehand. All highways were characterised by a specific milestone (see section on Milestones) to be reached around 2050. The selected highways were:

- *Space*. Identified as a key strain of actions leading to a fundamentally different spatial planning of land use throughout Europe, including the production of agricultural products in places that are most suitable.
- *Energy*. Identified as important aspect related to both spatial planning (biofuels) and climate change.
- *Climate change*. Identified as important aspect related to spatial planning. Especially climate adaptation was deemed crucial
- *Institutional*. Key highway in which fundamental institutional and governmental changes are described.
- *Norms and values*. Key highway in which awareness raising and behavioural change are described, both being central to the contextual storyline.

4.2.4 Obstacles and opportunities

The number of opportunities and obstacles was remarkably low, particularly given the fact that Sustainability Eventually portrays a fundamentally different situation in 2050. Yet, those that were identified are all crucial to the reasoning underlying the backcasting exercise and thus crucial to the feasibility of the identified endpoint.

Opportunities:

The multiple crises (2010) as mentioned in the narrative story set in motion ALL of the five highways. Without these crises the entire exercise stops or is severely delayed. Crucial for the spatial reorganisation is the CAP (2012) and various other existing plans (2020). The weakening of the EU (2025) – which was identified as a somewhat weak point in the storyline: why and how exactly would the EU weaken its position? – is a second crucial opportunity without which the backcasting would fail. A third and last crucial opportunity are the

possibilities offered by Web 2.0 (and 3.0) for training and education. This is essential for the behavioural change process.

Obstacles:

Equally crucial are three obstacles, and more specifically the financial crisis. It was noted that there is a tension between the financial means that are needed early on and the financial crisis that is ongoing at the same time. It was also noted that this potential lack of financial means to pay for monitoring of regulations, investments, new forms of education etc. could undermine the feasibility of the whole backcasting exercise. Additional obstacles were related to an early failure of the WFD (2015) – will this not lead to a failure of other changes e.g. institutional? – and the dominant role of the mass media – could they maintain control over media and thus obstruct awareness raising?

4.2.5 Milestones

A relatively large number of milestones was defined, the number being higher than the number of actions. The group felt that many milestones were needed as the Sustainability Eventually storyline leads to a fundamentally different situation in 2050. Thus, a large number of fundamental changes are needed to reach the desired endpoint in 2050.

Table 2. Overview of key milestones of Sustainability Eventually backcast, grouped by ‘highway’.

| Space | Energy | Climate change | Institutional | Norms and values |
|--|---|---|--|--|
| 2050: Diversified and harmonised agriculture and nature | 2050: Energy is 1. 90% green and 2. reduced consumption | 2050: Successful adaptation and mitigation of climate change | 2050: completely regionalised bottom-up institutional setting by ecoregion | 2040: consumer behaviour changed |
| 2040: reduced consumption of meat/dairy → less livestock → extensification | 2040: Coordinated supergrid established | 2020: no new powerplants without carbon capture and sequestration | 2040: Trust-based networks leading | 2040: sustainable tourism complete |
| 2040: increased agricultural production (through technology) | 2040: Renewable energy leading (PV, hydrogen, wind, biomass) | | 2030: Trust-based networks established | 2025: raised awareness |
| 2030: genetic diversity improved (agriculture and nature) | 2030: Domestic sector decentralised (70%) | | 2020: Water governance at catchment scale leading | 2020: Holistic education is the norm |
| 2030: Agriculture: agro-ecological Potential Based production established | 2030: successful Pilot Projects | | 2020: WFD successfully implemented | 2020: New types of media established (based on norms and values) |
| 2025: Decentralisation of CAP complete | 2025: goals for renewable energy achieved. | | 2020: Flood management directive effective | 2020: Sustainable consumption and production achieved |
| 2020: Higher eco-efficiency (less impact, more yield) | 2015: Integrated financial mechanisms established at different scales | | 2015: EU and national governments have become ‘greener’ | |
| 2020: Local & regional trading dominates | | | | |

In general Milestones are relatively well-spread between the five highways. Moreover, Milestones cover a relatively broad spectrum of goals that need to be met. Most specific Milestones are given for the ‘space’ highway. Specifically, important Milestones are:

Space: The end-point for this highway is a diversified and harmonised agriculture and nature. Within the context of Sustainability Eventually this means that by 2050 all agriculture a. takes place in locations that are potentially most suitable (2040); b. is more intensive in some places due to genetic improvements (2030) and technology

(2040); c. is less driven by consumption (2040); and d. dominated by local and regional trading (2020). The process is started after decentralisation of the CAP (2025).

Energy: The endpoint for this highway is twofold with 1. 90% green energy and 2. strongly reduced consumption. Key to this Milestone is a coordinated supergrid (2040) and strong initiatives in renewable energy making it leading (2040) after successful pilot projects (2030) and ambitious goals that are achieved (2025). An important prerequisite is an integrated financial mechanism that frees the funds to invest early on (2015).

Climate Change: The endpoint for this highway was defined as successful adaptation and mitigation of climate change. The only intermediate Milestone was related to a strict CCS procedure for new powerplants, which relates to the Energy highway.

This is the least well developed highway. It was flagged as very important, but did not receive much attention in the overall exercise. It seems that part of the goal can be met through the Energy highway (mitigation) and part through the Values and Norms highway (adaptation).

Institutions: The endpoint is a completely regionalised bottom-up institutional setting by ecoregion (2050). This is reached by having the Trust-based networks established (2030) and becoming leading (2040). This is preceded by a successful implementation of the WFD (2020) which is accompanied by a stronger water governance at catchment scale. The process is kick-started by a 'greening' of EU and national governments.

This highway was labelled as "most important" and "essential" throughout the backcasting exercise. This was in part based on earlier discussion on the narrative storyline in which an institutional change from top-down with power at EU level and for the national states, slowly changes to first an intermediate state where the EU weakens and eventually to a situation where a collection of Trust-based (local and regional) networks is in the lead in a new governance structure. This reasoning is adopted in the backcasting exercise as a prerequisite for any of the other highways to successfully take place.

Norms and values: The endpoint of this highway is reached somewhat earlier (2040) when consumer behaviour is completely changed. This is the product of a chain of Milestones that starts with the establishment of new types of media (2020) on the one hand and holistic forms of education that become the norm (2020) that quickly lead to a raised awareness (2025) which in turn slowly change behaviour. In a parallel track there are many spin-offs of this education/media change, importantly towards sustainable consumption, production (2020), and tourism (2040). Important is that key Milestones are rather early around 2020.

4.2.6 Actions

An almost equally large number of Actions was defined. Two highways – space and energy – needed most Actions; Climate Change and Institutional needed only a few actions. This partly reflects the actual ideas of the group on how this future could unfold: many specific actions are needed to reorganise the landscape and the energy sector, while a few key actions will ‘automatically’ lead to the required institutional changes and norms and values. Partly it also reflects the expertise present in the group (focus on energy, space, and norms and values).

Table 3. Overview of key action of the Sustainability Eventually backcast grouped by ‘highway’.

| Actions | | | | |
|--|--|--|--|--|
| Space | Energy | Climate change | Institutional | Norms and values |
| 2035: Investments in sustainable agriculture (EU and stakeholders) through technology | 2040: Policy Option Target Setting on renewable energy | 2040: Development of new techniques | 2040: implementation of sustainable strategy (regions) | 2030: Sustainable Consumption and production higher policy target. |
| 2025: accompanying measures on spatial planning | 2030: Policy Option Target Setting on renewable energy | 2020: Eco-engineering for sewage, industry and Heavily Modified Water Bodies | 2035: broad discussion on sustainable strategy (regions) | 2015: Enforce current SCP plan across Europe |
| 2025: rural development plans integrated (EU and regional) | 2025: transport coordination (regions) | 2015: Integrated water policies | 2010: investments in RTD | 2015: training teachers and experts |
| 2015: investments in agricultural technology (pan-Europe) | 2025: strict emission targets 40g CO2/km (EU) | | | 2015: Start grassroot local media |
| 2015: local and regional markets protected at EU level (new legislation, trading etc.) | 2025: investments in railroads | | | 2013: Open media education for civic society |
| 2015: new limitations for use of space for urban and industrial development | 2020: Implementation of new standards and norms for RE | | | |
| 2013: long-term integrated landscape-based monitoring and assessment | 2020: New standards in constructions and new technology | | | |
| | 2017: Implementation of CCS | | | |
| | 2015: Strategy Plan (new energy + adaptation + mitigation) | | | |

In detail, the following actions are required in the various highways:

Space: A large number of actions needs to be taken almost immediately to make the first steps towards a spatial reorganisation concrete. Importantly a monitoring system (2013), new sets of regulations on use of space (2015), investments in technology development (2015), and market protection (2015) need action right away. This needs to be followed-up by additional investments (2035) and additional spatial planning measures (2025). The two types of action are thus ‘investments’ and ‘regulations, measures, and laws’. Note that with the changing

character of the institutional system as well as newly emerging norms and values, these regulations are likely to demand constant updates.

Energy: The largest number of actions is related to this highway. Many are linked to actual ongoing initiatives (Carbon Capture and Sequestration; Policy Option Target Setting; Strategic Plans etc.) that are successfully continued. It felt by the group that a relatively large number of actions was needed to translate institutional windows of opportunity into action. Note that within this highway relatively much time was spend on discussing the role of businesses (that are notably absent from the backcasting exercise – an omission that was noted by the PEP members).

In short, early on a new Strategic Plan (2015) leads to the implementation of CCS (2017) and a number of new standards in construction and technological breakthroughs (2020). This is followed up by new and strict emission targets (2025), investments in railroads (2025) and a number of actions related to renewable energy (2030, 2040). The actions together help reducing energy consumption and achieving the target of 90% green energy.

Climate Change: As said, this highway has not been completely developed. Key actions towards a successful adaptation and mitigation of climate change include integration of water policies (2015); new eco-engineering techniques (2020) and development of new techniques (2040).

Institutional: The number of actions in this highway are equally low, but for a different reason. Key changes are assumed to happen ‘automatically’ (= in parallel processes not specified in this highway) in a chain of Milestones rather than actions, and reinforced mostly by the values and norms highway. For example, multiple crises change the political orientation of governments throughout Europe. This in turn leads to a successful implementation of the WFD which in turn weakens the role of the EU, which results in a foundation of the TBNs. A key action that is needed, however, are investments in RTD (2010), and much later a broad discussion on a new sustainable strategy (2035) culminating in the increased importance of the TBNs.

Norms and values: The actions in this highway are almost all concentrated in the early phase. Society at large will have the possibility to receive new forms of open media education (2013); grassroot movements further develop local media (2015); training programmes reach teachers and experts (2015); and the current Sustainable Consumption and Production plan is enforced. This combination of education, media, and regulations is assumed to be sufficient to very slowly change behaviour. Note that most actions are continuous rather than fixed in time. Training, education, and particularly the media continue to be important up until 2050.

4.2.7 Summary

Table 4 and Table 5 summarise the backcast within the context of the Sustainability Eventually storyline, in terms of total number and key milestones, obstacles etc.

Table 4. Summary of key elements of Sustainability Eventually backcast.

| | 2008 – 2015/2020 | 2015/2020 – 2030 | 2030 – 2050 |
|-------------------|--|--|---|
| Key milestones | holistic education goal for renewable energy met | TBNs established awareness raised | - TBNs leading - coordinated supergrid established - 90% green energy - consumer behaviour changed |
| Key obstacles | financial crisis | - | - |
| Key opportunities | web 2.0 | biodiversity action plan 2020 new role of EU | - |
| Key actions | - strict emission targets - integrated policies for water - start grassroot movements - stop green space use for agriculture and industry | - floodplain management introduced at all scales - transport coordination by region - accompanying measures for spatial planning | - Sustainable Consumption and production – higher policy targets - Renewable energy new Policy options - Implementation of sustainable strategy |

Table 5. Overview of total number of elements in the Sustainability Eventually backcast, by time period.

| | 2008 – 2015/2020 | 2015/2020 – 2030 | 2030 – 2050 | 2008 – 2050 |
|---------------------|---------------------|---------------------|-------------|-------------|
| Total milestones | 2 | 17 | 10+1 | 29+1 |
| Total obstacles | 3 | 2 | 0 | 5 |
| Total opportunities | 3 | 0 | 0 | 3 |
| Total actions | 9 | 14 | 5 | 28 |

Endpoint

The participants managed to reach the endpoint with remarkable ease. The five highways proved to all be within reach to complete by 2050. Participants also had the feeling that the five highways were sufficiently broad to capture all important elements needed to guarantee water supply by 2050.

Yet, stakeholders did specifically note their lack of expertise with crucial sectors that would need to be added to complete the picture. Two aspects that were mentioned:

- Businesses. Little is specified on the role of large and small enterprises, from farmers to industry. Their role for example in the TBNs was not discussed, neither was their involvement in new spatial planning and climate change mitigation. The group specifically noted that an additional highway on greening of businesses would have been good.
- Financial sector. The trade-off between economy and environment was specified as the most important one to realise the endpoint. Yet, lack of expertise on actual costs of certain actions left the group somewhat uneasy on the feasibility of the endpoint.

The feeling of the group can best be summarised as:

“The backcasting is realistic (milestones can be met in the given period of time) but partially incomplete”

The five highways versus water scenarios

The backcasting exercise ‘suffers’ from a similar problem as the Sustainability Eventually storyline: such a large number of fundamental social, institutional, political and economic changes are needed that the number of actions and milestones related to water is very low. Although the endpoint specifies water supply, this has all but disappeared from the separate highway endpoints and thus from the chains of actions that lead to these final milestones. As noted in earlier discussions after PEP1 and PEP2, a follow-up discussion would be necessary to increase the water related content. Additionally, separating water poor and water rich countries would aid to focus on the water issue.

Key obstacles and opportunities

As said, the number of obstacles and opportunities is low, but most are crucial underlying assumptions without (opportunities) or with (obstacles) which the backcasting would fail.

Key milestones

There are a large number of key milestones. Most crucial are the 5 that are identified as the end of the highways to be reached in 2050. All highways have at least one important intermediate milestone. Most important in those are the ones related to the institutional highway:

- greening of EU and national governments (2012)
- successful implementation of the WFD (2015)
- establishment of TBNs (2030) later to become leading (2040)

Key actions

There is an equally large number of key actions. They are spread relatively equal over time and over the various highways. Noteworthy is the high number of actions in the Norms and Values and Space and Energy highways. Note also the large number of actions that needs to be taken very early on, particularly to change behaviour and

in the energy sector. Finally, there are important actions that need to be taken later in time. Key actions are not related to the Institutional highway, and include:

- start of grassroot local media (2013)
- integrated water policy (2020)
- rural development plans integrated (2025)
- broad discussions about sustainable strategy (2035)
- development of new techniques (2040)

Because of the fairly general way of framing actions, it is somewhat speculative to relate this to key actors. Yet, by putting the institutional highway central, it becomes clear that the main actor is changing from EU (now) to EU and nation states (until 2020) to regions and nations (phasing out until 2040) to TBNs (from 2040).

4.3 Fortress Europe - backcasting results

Editor: Mathijs van Vliet

4.3.1 Backcast - overview timeline

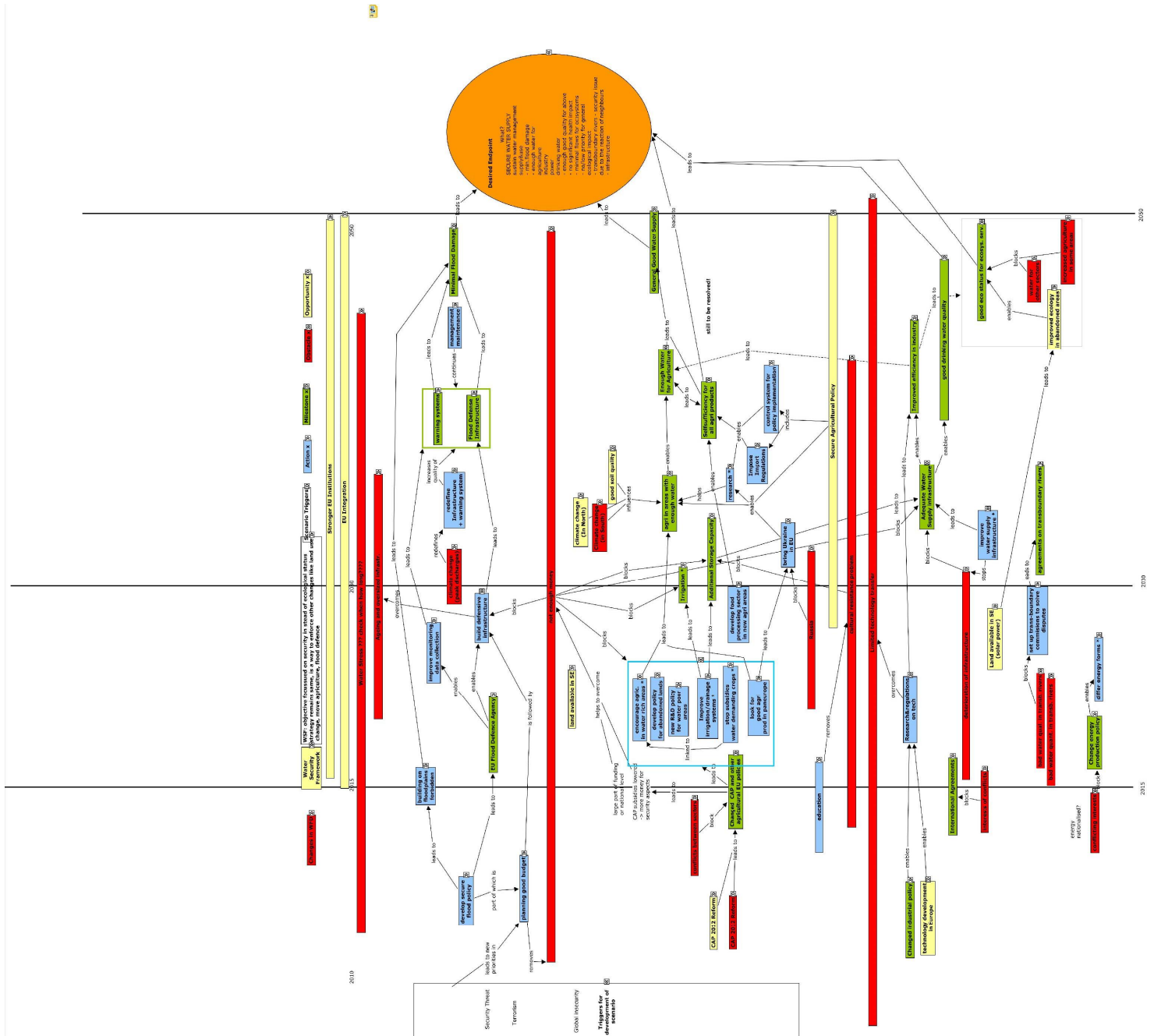


Figure 10. Main result of the backcasting exercise of Fortress Europe.

Endpoint

After some discussion, the following endpoint was agreed upon:

“Sustainable management of a secure water supply”.

This was narrowed down a bit further to: enough water and of a good enough quality for agriculture, industry, energy, and drinking water.

An important specification is the focus on security. The basic idea behind all actions is that they should lead to a secure Europe. Secure was understood in the sense that there is enough food, enough drinking water and enough products, of a good enough quality. Lowering water quality too much will lead to problems in this respect.

Remarks

The backcasting exercise was set up from the beginning according to a number of ‘highways’ of actions. As agriculture, industry, power and drinking water were perceived important, they all come back as milestones just before 2050. Furthermore, the flood threat was discussed in the storyline, and therefore also got a place in the backcasting exercise. In the later steps most attention was given to flood management and agriculture. Less time was devoted to the lower portion of the timeline (industry, energy, drinking water and ecological status). For agriculture a division was made between water rich and water poor regions. As water poor countries will see a loss of agriculture, policies are needed to develop them in different ways. For water rich countries it is important that new infrastructure is built, for instance for the food processing industry. The agriculture and industry highways are sometimes influencing each other, for instance in realm of water quantity available for both sectors.

4.3.2 Obstacles and opportunities

The number of both obstacles and opportunities was rather high. Particularly the number of opportunities is somewhat remarkable as Fortress Europe is often seen as an undesirable future. Apparently there are still possibilities for sustainable water management, even in a more negative future.

Opportunities

The main opportunities that play in the background are stronger EU institutions and EU integration (both 2015 onwards). Those are not directly connected to any actions or milestones in the timeline, but are needed to execute some of the more difficult actions like moving agriculture to water rich areas, or the establishment of the EU Flood Defence Agency. The Secure Agricultural Policy (2025 onwards) enables a large number of milestones in the last period. Some trends that seem negative, like abandoning of land can also be seen as an opportunity, such as the improvement of ecology in abandoned areas (2045).

Obstacles

The most important obstacle is the lack of money. This should be dealt with by planning a good budget, based on the new priorities. As priorities are on different issues at the beginning there is the obstacle of aging and deteriorating infrastructure, both in the flooding and industry/agriculture highways. Climate change appears as an obstacle in the flooding and agriculture highways. It poses a thread as they make the water availability (including flooding) more uncertain. Another obstacle is cultural resistance against the security oriented approach. It is mainly dealt with by education, but the storyline also describes that it decreases in time as people get used to the security doctrine.

4.3.3

4.3.4 Milestones

Nineteen milestones were defined. Often several actions lead to one milestone, but some milestones are also followed by other milestones. As most milestones are connected to other milestones and actions they form highways from the present to the goal. The milestones can be grouped under each highway.

Table 6. Overview of key milestones of Fortress Europe backcast, grouped by 'highway'

| Flooding | agriculture | industry | other |
|---|---|--|---|
| 2045: minimal flood damage | 2050: General good water supply | 2040: improved efficiency in industry | 2045: good ecological status for ecosystem services (where used) |
| 2040: flood warning systems in place, flood defence infrastructure in place | 2040: Enough water for Agriculture | 2035: adequate water supply infrastructure | 2045: good drinking water quality |
| 2020: EU Flood Defence Agency set up. | 2040: self-sufficiency for all agricultural products 2035: agriculture mainly situated in areas with enough water 2030: additional storage capacity in place 2030: irrigation systems in place 2015: changed CAP and other agricultural EU policies | 2012: changed industrial policy | 2030: agreements on trans-boundary rivers 2017: changed energy production policy (diversification) |

The agriculture highway got the most milestones, milestones being connected and together with actions forming a true highway. The majority of the milestones in the others highways are more or less stand alones, with only one or none actions attached. They also are not connected to the end point. Time was the limiting factor here and agriculture was seen as most important. Specifically, important Milestones are:

Flooding: The end-point for this highway is minimal flood damage. Flood damages are perceived as a security threat, as they diminish resources and are very costly. Both flood defence infrastructure and a good warning system are needed to lower flood impacts. Where impacts are high (urbanised areas) the attention will be more on flood defence, where impacts are lower flood warning systems (in combination with non-structural measures) should lower the flood damages. As climate change influences the likelihood of floods the flood warning and defence systems need to be updated after 2030. This process is started by the establishment of the EU Flood Defence Agency in 2020, which is grounded in the Secure Flood Policy.

Agriculture: The endpoint for this highway is enough water for Agriculture, which in turn should lead to a general good water supply (also for other sectors). The goal of enough water for agriculture is coupled to the goal of Self-sufficiency for all agricultural products.

As water resources are limited agriculture is stimulated in areas with enough water (by 2035). Furthermore additional storage capacity and irrigation systems need to be in place around 2030. This is all made possible by a large series of actions originating from the Secure Agriculture Policy (from 2025 onwards) and the changed CAP and other agricultural EU policies (from 2012 onwards).

Industry: The endpoint of this highway was defined as an improved efficiency in industry (2040). It is linked to the general good water supply and enough water for Agriculture. After all, industry will improve its efficiency which leaves more water for the agricultural sector. The industry should mainly take its own actions, with policies in place to stimulate them. An Adequate water supply infrastructure (2035) will enable the improve efficiency. The changed industrial policy (2012) aims to get basic production back in the EU and works on diversification. As this will lead to an increase in industry in Europe it is an extra reason for an improved efficiency.

Other: A number of milestones are not linked to the desired endpoint. For instance the good ecological status for ecosystem services milestone. The background of this milestone is that some ecosystem services are needed in Europe. In some places for instance fisheries play an important role. Where they do it might be necessary for the security of the area to have a good ecological status of the water in that area in order to maintain the ecosystem services. In order to solve trans-boundary disputes, agreements on transboundary rivers are needed (2035). This will ease troubles with neighbouring countries and thus aid the security of Fortress Europe. A continuous supply

of energy is important for the security of Fortress Europe. Therefore energy production policies are changed around 2017 in order to produce more energy within Europe. Different energy sources will be used.

4.3.5 Actions

Twenty three actions were defined. Especially the agriculture highway needed many actions; with twelve actions half of the actions were located within this highway. As indicated above, lack of time will most likely have lead to missing actions in the industry and other highways. Some actions directly lead to a milestone, but many actions are followed by other actions. Sometimes multiple actions need to be combined to reach a milestone.

Table 7. Overview of key actions of the Fortress Europe backcast, grouped by 'highway'.

| Flooding | Agriculture | industry | other |
|---|---|---|-------|
| 2045: management maintenance 2035: redefine infrastructure and warning system 2027: build/improve defensive infrastructure 2022: improve monitoring & data collection 2015: building in floodplains is forbidden 2012: develop secure flood policy 2012: planning good budget (part of SFP) | 2035: control system for policy implementation 2035: Impose import regulations 2035: Research: - centralize agricultural research (alternative crops, different strands, etc.) - new agricultural practices, changes crops on less water, regional and socially stable 2032: bring Ukraine in the European Union 2025: develop food processing sector in new agricultural areas 2020: encourage agriculture in water rich areas 2020: develop policy for abandoned lands 2020: new R&D policy for abandoned lands 2020: build and reconstruct irrigation, drainage and water distribution systems, especially in water rich regions. 2020: stop subsidies on water demanding crops, especially in water poor regions. 2020: look for good agricultural production areas in Pan-Europe 2015: Education: - introduction of new lifestyle by education and knowledge dissemination - involving stakeholders in changes - build capacity with stakeholders (at all levels) to deal with obstacles and use opportunities | 2032: improve water supply infrastructure 2020: research and regulations technology development 2020: establish requirements for use of best available technology (water efficient) | |

In detail, the following actions are required in the various highways:

Flooding: the action management maintenance (2045) shows the importance of continuously maintaining flood defence infrastructure and updating warning systems on the ground of new data. This is also shown in the action redefine infrastructure and warning system (2035), which is a reaction on climate change. These actions are lead

or monitored by the EU Flood Defence Agency which was founded after the development of the Secure Flood Policy (2012). Another important action is to prohibit construction in floodplains (2015).

Agriculture: The largest number of actions is related to this highway. There are especially many actions around 2020. These actions can be seen as an action-package that is derived from the changed CAP and other agricultural policies. Some of the more controversial actions will be implemented incrementally, taking most effect later on. They are incorporated in the Secure Agriculture Policy, which was already envisioned in the original storylines. The main actions are related to produce agricultural products in those areas where resources to produce them are plentiful. This includes water, but also energy and other resources. Others are meant to make sure that the abandoned areas are revitalised in new ways. Another important string of actions is to look for good agriculture production areas in pan-Europe, which leads to the inclusion of Ukraine in the EU (2030-35). As not all policies might be desired by all regions, a strict control system (2035) is needed when the actions become more and more apparent in the field.

Industry: the main action in this highway are taking place around 2020 when new technologies are researched. requirements for use of best available technology (water efficient) are established, in order to increase the overall resource efficiency. Further on the water supply infrastructure for industries and other sectors is improved (2030-35), to stop the deterioration of the infrastructure that was neglected in the previous decades.

Other:

Trans-boundary commissions will be set up to solve disputes over poor water management in trans-boundary rivers. This can be done within the EU and with neighbouring countries, tackling both water quality and quantity issues. Different energy forms will be promoted in order to diversify the energy production. This will lead to a higher self-sufficiency of energy, and a lower dependence on one type of energy (lowering the vulnerability to attacks).

4.3.6 Summary

Table 8. Summary of key elements of Sustainability Eventually backcast.

| | 2008 – 2015/2020 | 2015/2020 – 2030 | 2030 – 2050 |
|-------------------|--|--|---|
| Key milestones | Security Thread (trigger for scenario) changed industrial policy changed CAP and other agricultural policies | EU flood Defence Agency in place, irrigation system in place change energy production policy | flood warning systems and defence infra in place selfsufficiency for all agricultural products improved efficiency in industry good drinking water quality |
| Key obstacles | lack of money | limited technology transfer deterioration of irrigation infrastructure lack of money | limited technology transfer water stress in some areas, climate change, |
| Key opportunities | CAP 2012 reform current technology development in Europe | stronger EU institutions EU integration start of Secure Agricultural Policy | stronger EU institutions EU integration Secure Agricultural Policy |
| Key actions | development of secure flood policy, education planning good (security focussed) budget | flood defence infrastructure stop subsidies for water demanding crops, encourage agriculture in water rich areas, policy for abandoned lands | management and maintenance of flood warning and defence systems strong control system for implementation of SAP. improve water supply infrastructure (agri, industry, drinking, etc.) |

Table 5. Overview of total number of elements in the Sustainability Eventually backcast, by time period.

| | 2008 – 2015 | 2015 – 2030 | 2030 – 2050 | 2008 – 2050 |
|---------------------|-------------|-------------|-------------|-------------|
| Total milestones | 3 | 6 | 14 +1 | 19+1 |
| Total obstacles | 8 | 11 | 11 | 18 |
| Total opportunities | 2 | 5 | 6 | 11 |
| Total actions | 4 | 14 | 7 | 23 |

Endpoint

The participants managed to reach the endpoint but it was not always easy. Especially the agriculture highway posed serious challenges. This also led to a shortage of time to fully develop the others and industry highways. The participants did, however, see possibilities to reach the desired objective by 2050. The different highways were chosen as they show the most important aspects for the security of Fortress Europe in relation to water. For example ecological status is hardly dealt with, which is in accordance with the logic of the storyline in which ecological status is only important where there were heavily utilised ecosystem services (like fishing) are present. The group regretted mainly that the industry and energy highways were underdeveloped.

The highways versus water scenarios

Overall the participants managed to keep within the context of the Fortress Europe storyline to a large extent. This was possible because all participants of PEP3 participated at least in one of the previous PEP workshops. Although the link between obstacles and opportunities and milestones and actions was often weak, opportunities and obstacles did help as reminders of the storyline. Participants also often asked themselves the question “Does this fit in a Fortress Europe?”. The desired endpoint was also specified for Fortress Europe, which made it easier to focus on the different highways. Some of them (like energy) are however not clearly linked to secure water supply. A follow-up discussion would be necessary to finalise the underdeveloped highways, and include the water related content in the energy highway.

Key milestones

There are a large number of key milestones. Most crucial are the ones directly linked to the desired endpoint:

- Minimal flood damage,
- General good water supply (split up in enough water for agriculture and improved efficiency in industry)
- Good ecological status for ecosystem services.
- Good drinking water quality

Changes in policies (flood, agriculture, industry and energy) are needed in the first period, or beginning of second, in order to reach the desired endpoint in 2050.

Key actions

Most of the key actions are taken in the first and second period. They often include policies on which the other actions build, like the development of a secure flood policy (2012) in the flooding highway. In the agriculture highway there is not one clear key action, but more a whole group of actions (around 2020) that need to be taken together in order to make the changes needed. There is an equally large number of key actions. These too include policies. Because of the fairly general way of framing actions, it is somewhat speculative to relate this to key actors. However, from the discussion it became clear that a strong role of the EU is needed in keeping the EU together under the large changes needed. Specifically transboundary commissions are mentioned, as is the role of industries in improving their own efficiency. In the flooding highway an EU Flood Defence Agency is established, which enables further actions. Education needed to overcome cultural resistance is a task for the education system, but can also be partly performed via (mass) media.

Key obstacles and opportunities

Most obstacles and opportunities are not very well linked to actions and milestones in the timeline, but do form crucial underlying assumptions without (opportunities) or with (obstacles) which the backcasting would fail.

Remarks

There was a lack of time to complete the task. Therefore there are several highways that are somewhat underdeveloped. An aspect like maintaining a basis water quality was, for example, not taken into account. Consequently, the problem of maintaining a good ecological status for those areas where ecosystem services are used was not solved. This was noted explicitly by the participants. The energy question was not addressed thoroughly enough either. Although the transboundary issues were only slightly touched upon, this was seen as a smaller problem as it also only plays a minor role in the storyline.

The short recap of the storylines in the form of red threads helped to get the participants up to speed with the main underlying assumptions of the storylines. The fact that all participants of the Fortress Europe group had been in a previous PEP workshop helped substantially. Exercises on indicators during the first day of the workshop helped to refresh the memory of the participants. This all made it possible to start the backcasting exercise relatively fast and fluently. Working backwards, however, did prove difficult for the participants. After the desired endpoint was discussed the first milestones were relatively easily placed around 2045-40, many other milestones and actions were more discussed from the present starting point. Those actions and milestones were, however, checked to see if they did bridge the gap to the future milestones.

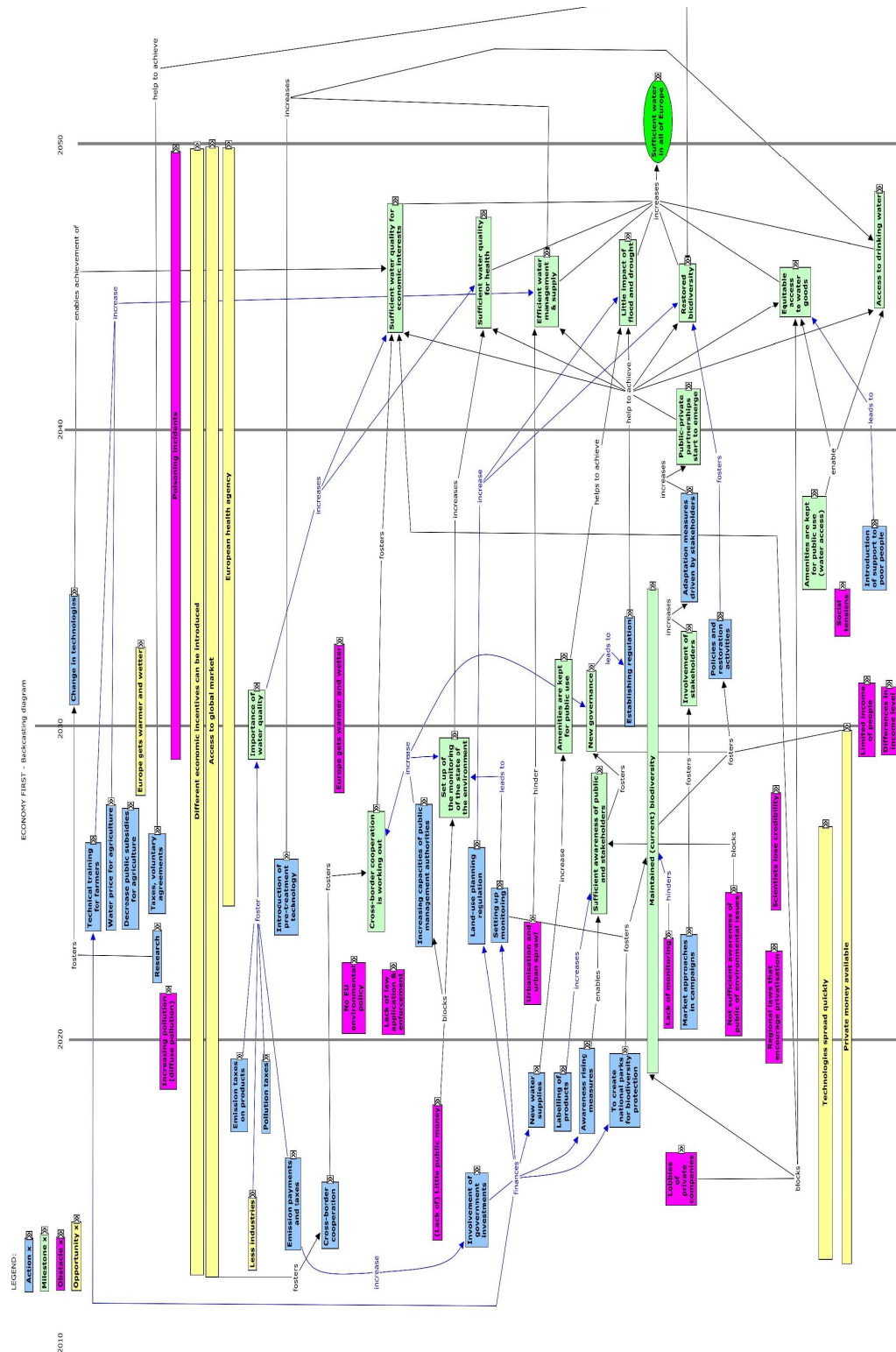
It is interesting that the participants managed to reach the desirable endpoint. It did help to rephrase the endpoint from a much more sustainable water supply to a secure water supply. However, the group also noted that for a secure water supply it also needs to be sustainable. At least a basic water quality is needed for many water uses, therefore there needs to be some water quality standards. Also depletion of water resources in the south was perceived as a problem for agricultural production, therefore 'sustainable' actions like the stop for subsidies on water demanding crops were taken.

4.4 Economy First - backcasting results

Editors: Anna Dubel and Ilona Bärlund

4.4.1 Backcast - overview timeline

Figure 11. Main result of the backcasting exercise of Economy First.



4.4.2 Endpoint

The group quickly agreed on the following desired endpoint:

“Sufficient water in all of Europe”

This aim for a more sustainable water supply was specified in a subsequent discussion, asking the question: “Where can we get in 2050 given the Economy First storyline?”

- Efficient water supply and management
- Restored biodiversity
- Sufficient water quality for health and economic interest
- (No) Improved equitable access (differs for regions)
- Are we willing to accept new standards in water quality? Fewer chemicals can be addressed than at present
- Little impacts of floods and droughts

These elements were kept in mind when classifying actions and milestones. In the analysis of milestones, actions, opportunities and obstacles, four categories were defined that were used to structure the results. These categories are the same as the highways of actions that were defined during the analysis. Importantly, these highways were not recognised as such during the exercise and only named during the analysis of the results, contrary to Sustainability Eventually and Fortress Europe. Therefore they are used first as identifying categories and only subsequently discussed as highways. The clusters are:

1. technological approach to problem solving
2. international cooperation
3. public-private cooperation
4. economic instruments

4.4.3 Obstacles and Opportunities

The number of opportunities and obstacles is sufficient and corresponds with the logic of the storyline. In principle we use the four categories mentioned above; when an obstacle or an opportunity did not exactly fit we assigned it based on the categorisation of action(s) or milestone(s) that it corresponds to.

Table 10. Opportunities as identified in the Economy First backcast, grouped by 'highway'.

| Opportunities | | | |
|--|------------------------------|-------------------------------|--|
| TECHNOLOGICAL APPROACH TO PROBLEM SOLVING | INTERNATIONAL COOPERATION | PUBLIC-PRIVATE COOPERATION | ECONOMIC INSTRUMENTS |
| 2040: Europe as a forerunner in environmental technology and product standards | | 2040: European Health Agency | 2040: Different economic incentives can be introduced 2040: Access to global market |
| 2030: Europe as a forerunner in environmental technology and product standards 2030: Europe gets warmer and wetter 2020: Europe as a forerunner in environmental technology and product standards 2020: Technologies spread quickly | | 2030: European Health Agency | 2030: Different economic incentives can be introduced 2030: Access to global market |
| 2010: Technologies spread quickly | | | 2020: Different economic incentives can be introduced 2020: Access to global market 2020: Private money available 2010: Different economic incentives can be introduced 2010: Access to global market 2010: Private money available |

There are several opportunities which are in place for many years as indicated in the above table.

Table 11. Obstacles as identified in the Economy First backcast, grouped by 'highway'.

| Obstacles | | | |
|--|------------------------------|--|--|
| TECHNOLOGICAL APPROACH TO PROBLEM SOLVING | INTERNATIONAL COOPERATION | PUBLIC-PRIVATE COOPERATION | ECONOMIC INSTRUMENTS |
| 2040: Poisoning incidents | | 2035: Social tensions | |
| 2030: Poisoning incidents 2030: Europe gets warmer and wetter | | | 2030: Limited income of people 2030: Differences in income level |
| 2025: Scientists loose credibility 2020: Increasing pollution (diffuse pollution) 2020: Lack of monitoring | | 2020: No EU environmental policy 2020: Lack of law application and enforcement 2020: Urbanization and urban sprawl 2020: Not sufficient awareness of public of environmental issues 2010: Lobbies of private companies | 2020: Regional laws that encourage privatisation 2010: Lack of public money |

Obstacles correspond very well to the identified strategies (see section on strategies). The analysis shows that for some strategies such as international cooperation there were no opportunities or obstacles identified. Especially for the obstacles it was difficult to assign them so that they correspond with the main idea of the strategy. The reason is that the obstacles as well as opportunities refer to the external factors that influence the strategy therefore they are not embedded in the strategy itself. They are threats to the strategy, not weaknesses of the strategy.

4.4.4 Milestones

A total of about 20 milestones were identified, the majority of which is presented in the table below. The milestones are distributed unevenly among the categories, with most emphasis in the technological and public-private partnership categories. More than half of the milestones were seen to have important technological aspects. The number of milestones related to economic incentives was surprisingly low.

Table 12. Overview of key milestones of Economy First backcast, grouped by ‘highway’

| Milestones | | | |
|--|---|--|---|
| TECHNOLOGICAL APPROACH TO PROBLEM SOLVING | INTERNATIONAL COOPERATION | PUBLIC-PRIVATE COOPERATION AND NEW GOVERNANCE | ECONOMIC INSTRUMENTS |
| 2045: Efficient water management & supply | | 2045: Equitable access to water goods | 2045: Sufficient water quality for economic interests |
| 2045: Sufficient water quality for health | | | |
| 2045: Little impact of flood and drought | | | |
| 2045: Restored biodiversity | | | |
| 2045: Access to drinking water | | | |
| | | 2040: Public-private partnerships start to emerge | |
| 2035: Amenities are kept for public use | | | |
| 2030: Importance of water quality | | 2030: Involvement of stakeholders | 2030: Importance of water quality |
| 2030: Amenities are kept for public use (water access) | | 2030: New governance | |
| 2028: Set up of the monitoring of the state of the environment | | | |
| | 2025: Cross-border cooperation is working out | | |
| | | 2025: Sufficient awareness of public and stakeholders | |
| 2018: Maintained (current) biodiversity | | | |

4.4.5 Actions

A few more actions than milestones were defined. The actions are distributed evenly among the categories. There are no actions that can directly fall into health or climate change category, however Economic Instruments, Public-Private Cooperation and Technological Approach to Problem Solving are realizing the milestones indicated in Health and CC categories. Note the low number of actions related to international cooperation, and the high number of economic measures.

Table 13. Overview of key actions of the Economy First backcast, grouped by ‘highway’

| Actions | | | |
|---|--------------------------------------|---|--|
| TECHNOLOGICAL APPROACH TO PROBLEM SOLVING | INTERNATIONAL COOPERATION | PUBLIC-PRIVATE COOPERATION | ECONOMIC INSTRUMENTS |
| 2030: Change in technologies | | 2035: Adaptation measures driver by stakeholders 2030: Establishing regulations 2030: Policies and restoration activities | 2035: Introduction of support to poor people |
| 2025: Technical training for farmers | | 2025: Increasing capacities of public management authorities 2025: Land-use planning regulation | 2025: Decrease public subsidies for agriculture 2025: Water price for agriculture |
| 2025: Introduction of pre-treatment technology 2025: Setting up monitoring 2020: research (private companies) 2015: New water supplies 2015: To create national parks for biodiversity protection | | 2020: Market approaches in campaigns 2015: Awareness rising measures | 2025: Taxes, voluntary agreements 2015: pollution taxes 2015: Labelling of products |
| | 2012: Cross-border cooperation | | 2015: Emission taxes on products 2012: Involvement of government investments 2012: Emission payments and taxes |

4.4.6 Strategies

As said, from the backcasting exercise 4 strategies were defined *a posteriori* that together sum up the entire backcast.

Technological approach to problem solving

Endpoints: Sufficient water quality for economic interests (2045), Sufficient water quality for health (2045), Efficient water management & supply (2045), Little impact of flood and drought (2045), Equitable access to water goods (2045), Access to drinking water (2045), Restored Biodiversity (2045)

Key actions: research (2020) and change in technologies (2030), Setting up monitoring (2025), Introduction of pre-treatment technology (2025), New water supplies (2015), Land-use planning regulation (2025)

Key milestones: Set up of the monitoring of the state of the environment (2030), Amenities are kept for public use (2030), Amenities are kept for public use – water access (2035), Maintained (current) biodiversity (2018)

Key actors: central and local government, private companies

International cooperation

Endpoints: Sufficient water quality for economic interests (2045), Sufficient water quality for health (2045)

Key actions: Cross-border cooperation (2015)

Key milestones: Cross-border cooperation is working out (2025)

Key actors: central and local government, private companies

Public-private cooperation and new governance

Endpoints: Sufficient water quality for economic interests (2045), Sufficient water quality for health (2045), Efficient water management & supply (2045), Little impact of flood and drought (2045), Equitable access to water goods (2045), Access to drinking water (2045), Restored Biodiversity (2045)

Key actions: Awareness rising measures (2018), Market approaches in campaigns (2020), Adaptation measures driven by stakeholders (2035), create national parks for biodiversity protection (2015), Policies and restoration activities (2030),

Key milestones: Sufficient awareness of public and stakeholders (2025), New governance (2030) and Public-private partnerships start to emerge (2040)

Key actors: central and local government, private companies, society

Economic instruments

Endpoints: Sufficient water quality for economic interests (2045), Sufficient water quality for health (2045), Efficient water management & supply (2045), Little impact of flood and drought (2045), Equitable access to water goods (2045), Access to drinking water (2045), Restored Biodiversity (2045)

Key actions: Emission payments and taxes (2012), Involvement of government investments (2012), pollution taxes (2015), Taxes, voluntary Agreements (2025), Emission taxes on products (2015)

Key milestones: Importance of water quality (2030)

Key actors: central and local government, private companies

4.4.7 Strategies in detail

Indicated highways are serving several different endpoints. Chains of actions and milestones leading to an achievement of a specific endpoint are specified below.

GOOD WATER QUALITY FOR ECONOMIC INTERESTS

Technologies

endpoint: Sufficient water quality for economic interests (2045)

key action: research (2020) and change in technologies (2030)

key milestone: -

key actor: central and local government, private companies

International cooperation

endpoint: Sufficient water quality for economic interests (2045)

key action: Cross-border cooperation (2015)

key milestone: Cross-border cooperation is working out (2025)

key actor: central and local government

Public-private cooperation

endpoint: Sufficient water quality for economic interests (2045)

key action: Awareness rising measures (2018), Market approaches in campaigns (2020), Adaptation measures driven by stakeholders (2035)

key milestone: Sufficient awareness of public and stakeholders (2025), New governance (2030) and Public-private partnerships start to emerge (2040)

key actor: central and local government, private companies, society

GOOD WATER QUALITY FOR HEALTH

Technologies

endpoint: Sufficient water quality for health (2045)

key action: Setting up monitoring (2025)

key milestone: Set up of the monitoring the state of the environment (2030)

key actor: government

International cooperation

endpoint: Sufficient water quality for health (2045)

key action: Cross-border cooperation (2015)

key milestone: Cross-border cooperation is working out (2025)

key actor: central and local government

Public-private cooperation

endpoint: Sufficient water quality for health (2045)

key action: Awareness rising measures (2018), Market approaches in campaigns (2020), Adaptation measures driven by stakeholders (2035)

key milestone: Sufficient awareness of public and stakeholders (2025), New governance (2030) and Public-private partnerships start to emerge (2040)

key actor: central and local government, private companies, society

EFFICIENT WATER MANAGEMENT & SUPPLY

Technologies

endpoint: Efficient water management & supply (2045)

key action: Introduction of pre-treatment technology (2025)

key milestone: -

key actor: private and public sectors

Public-private cooperation

endpoint: Efficient water management & supply (2045)

key action: Adaptation measures driven by stakeholders (2035) and Awareness rising measures (2015)

key milestone: Public-private partnerships start to emerge (2040), new governance (2030)

key actor: private and public sectors

COMBATING IMPACT OF FLOODS AND DROUGHT

Technologies

endpoint: Little impact of flood and drought (2045)

key action: New water supplies (2015)

key milestone: Amenities are kept for public use (2030)

key actor: private and public sectors

Public-private cooperation

endpoint: Little impact of flood and drought (2045)

key action: Adaptation measures driven by stakeholders (2035) and Awareness rising measures (2015)

key milestone: Public-private partnerships start to emerge (2040), new governance (2030)

key actor: private and public sectors

CLIMATE CHANGE

Economic instruments

endpoint: Little impact of flood and drought (2045)

key action: Emission payments and taxes (2012), pollution taxes (2015), Taxes, voluntary Agreements (2025)

key milestone: --

key actor: public and private sectors

RESTORATION OF BIODIVERSITY

Public-private cooperation

endpoint: Restored biodiversity (2045)

key action: Adaptation measures driven by stakeholders (2035) and Awareness rising measures (2015)

key milestone: Public-private partnerships start to emerge (2040), new governance (2030)

key actor: private and public sectors

Institutional approach

endpoint: Restored biodiversity (2045)

key action: Setting up monitoring (2025), create national parks for biodiversity protection (2015), Policies and restoration activities (2030)

key milestone: Set up of the monitoring the state of the environment (2028), Maintained (current) biodiversity (2018)

key actor: private and public sectors

SECURING EQUITABLE ACCESS TO WATER GOODS

Technologies

endpoint: Equitable access to water goods (2045)

key action: --

key milestone: Amenities are kept for public use (2035)

key actor: private and public sectors

Public-private cooperation

endpoint: Equitable access to water goods (2045)

key action: Adaptation measures driven by stakeholders (2035) and Awareness rising measures (2015)

key milestone: Public-private partnerships start to emerge (2040), new governance (2030)

key actor: private and public sectors

SECURING ACCESS TO DRINKING WATER

Technologies

endpoint: Access to drinking water (2045)

key action: Introduction of pre-treatment technology (2025)

key milestone: Amenities are kept for public use – water access (2035)

key actor: private and public sectors

Public-private cooperation

endpoint: Access to drinking water (2045)

key action: Adaptation measures driven by stakeholders (2035) and Awareness rising measures (2015)

key milestone: Public-private partnerships start to emerge (2040), new governance (2030)

key actor: private and public sectors

4.4.8 Summary

Table 14. Summary of key elements of Economy First backcast.

| | 2008 – 2015/2020 | 2015/2020 – 2030 | 2030 – 2050 |
|-------------------|---|---|--|
| Key milestones | Maintained (current) biodiversity | Sufficient awareness of public and stakeholders | Involvement of stakeholders New governance Public-private partnerships start to emerge |
| Key actions | Involvement of government investments Awareness rising measures | Increasing capacities of public management authorities Research | Establishing regulation Adaptation measures driven by stakeholders Change in technologies Social tensions |
| Key obstacles | (Lack of) Little public money Lobbies of private companies | Urbanisation and urban sprawl Lack of monitoring Not sufficient awareness of public of environmental issues | |
| Key opportunities | Technologies spread quickly Different economic incentives can be introduced Access to global market | Technologies spread quickly Different economic incentives can be introduced Access to global market | Different economic incentives can be introduced Access to global market |

Table 15. Overview of total number of elements in the Economy First backcast, by time period.

| | 2008- 2015 | 2015-2030 | 2030-2050 | 2008-2050 |
|--|-----------------------|------------------|------------------|------------------|
| Total milestones | 0 | 7 | 14 | 17 |
| Total obstacles | 1 | 14 | 5 | 15 |
| Total opportunities | 5* | 6* | 5 | 8 |
| Total actions | 3 | 17 | 5 | 24 |
| * out of these 2 continuous 2012-2050 and one continuous 2025-2050 | | | | |
| | 2008- 2020 | 2020-2030 | 2030-2050 | 2008-2050 |
| Total milestones | 1 | 7 | 14 | 17 |
| Total obstacles | 4 | 12 | 5 | 15 |
| Total opportunities | 5 | 6 | 5 | 8 |
| Total actions | 9 | 10 | 5 | 24 |

Endpoint

There are many highways as the achievement of milestones depends on several very different actions taking place in different time periods. There are many different paths some of them leading to achievement of several milestones.

The four highways versus water scenarios

The backcasting was much “greener” than the storyline. The milestones can be achieved with certain probability. The actions and milestones correspond with the logic of the storyline, however they lean towards sustainable development approach rather than pure economic growth approach, which was needed to achieve the goal “sufficient water in all Europe”. The key for selecting

Key milestones

There is only one milestone in the first period “Maintained (current) biodiversity”. In the second and third periods the key milestones were considered the ones that have influence on the highest possible number of actions or milestones.

Key actions

The key actions were considered the ones that have influence on the highest possible number of actions or milestones.

Key obstacles and opportunities

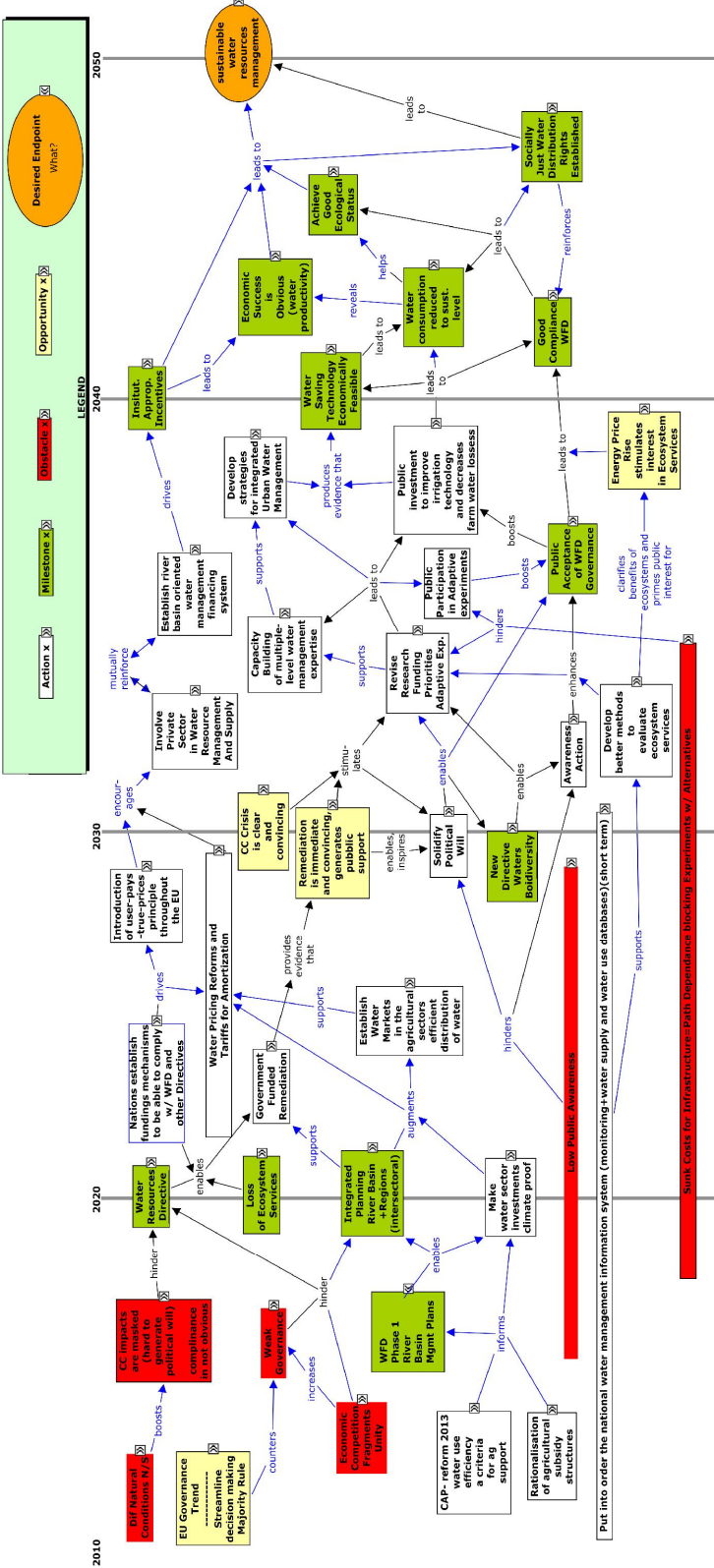
The number of obstacles and opportunities is sufficient, however most of the obstacles were not connected to actions or milestones, due to the limited time for the exercise. The key opportunities that are visible throughout the whole time period are: “Different economic incentives can be introduced” and “Access to global market”.

4.5 Policy Rules - backcasting results

Editor: Jan Sendzimir

4.5.1 Backcast - overview timeline

Figure 12. Main result of the backcasting exercise of Policy Rules.



4.5.2 Endpoint

After brief discussion, the following endpoint was agreed upon:

“Sustainable water resources management.”

The principal goal of the Policy Rules scenario has been to sustainably provide acceptable levels of water quantity and quality in the EU in the socio-political context where policy has a leadership role in setting society's development path. This follows from the participants' desire to explore the potential for government administration to increase capacity to cope with and adapt to uncertainty from global sources of change. This would be accomplished by providing competent regulation at multiple scales in harmony with the promotion of science and industry as well as ecosystem services. This endpoint springs naturally from the principal goal, but it was deliberately kept broad in scope to facilitate consideration of the many avenues by which it might be approached. Whether the broad scope provided such a wide conceptual arena that it liberated the participants' imagination or froze it for lack of easy connection to known reference points remains a methodological question that will require comparative experimentation.

Remarks

During the course of the exercise three main points in time were identified as crucial: 2030, 2040, and 2050. This logic divides the storyline into periods of increasing uncertainty, especially with respect to climate change. The first period ends at a point, 2030, when climate change impacts are anticipated to become much more visible in their incidence and impact. The initial period from 2010 to 2030 is expected to resemble the present in terms of climactic variability, but the frequency and intensity of extreme events and trends is expected to rise after that. The remaining, higher level of uncertainty was divided into two equal ten-year blocks. In general, aside from known dates, e.g. when river basin management plans are slated for completion (2015), the participants' had so few points of reference that their imagination might be stifled by the extreme degree of the uncertainty. These periods were taken as arbitrary means to add just enough structure to embolden the imagination to consider the future in manageable steps.

The units (milestones, actions, obstacles and opportunities) were the principal building blocks that started and sustained discussion the backcasting exercise. To stimulate free thinking the participants were encouraged at the start to imagine how their interactions might make these units cluster into 'highways' of related activities. While the highway concept probably was a useful stimulus it was not fully realized as distinct highways by the end of the exercise. Time was devoted to careful discussion of the meaning of each unit and their relations to each other in time. However, few of these relations were crystallized as causal links (arrows) that gave a higher definition to the shape of the highway.

The original storyline devotes some attention to addressing the implications of regional diversity in terms of water availability (North – rich / South – poor) and socio-economic development (Northwest – rich / Southwest – Poor). The backcasting exercise did not progress far enough to consider this level of detail. All available time was devoted to considering two principal avenues or highways along which EU society as a whole would enrich its capacity to sustainably manage water. These highways correspond roughly to Economy and Institutions (or Governance), and they are evident in the top (Economy) and bottom (Institutions) halves of the backcasting timeline. However, as the timeline repeatedly shows, these highways run in parallel but are not independent. They are joined more than once in a braided web of relations. This rich mixture of complementary influences mirrors our historical experience of times of transition. As Polish folk wisdom concludes about April's stormy transition from winter to summer:

“Kwiecień plecień co przeplata trochę zimy trochę lata.”
April is a weaver that braids a bit of winter with a bit of summer

4.5.3 Opportunities and Obstacles

In comparison with Milestones and Actions, the number of opportunities and obstacles was notably low. Again, this may stem from the time limits on the exercise and/or from a tendency for participants to start such exercises with the easiest mental tasks, conceiving of activities they would like to promote in pursuit of a goal, as opposed to factors that might aid or block those activities. This can occur despite the facilitator's urging to give balanced consideration to each set of units (Milestones, Actions, Opportunities, and Obstacles). In the throes of the creative process, far more Actions occurred to the participants than anything else. However, this does not devalue the importance of the Opportunities and Obstacles. They proved of pivotal importance in establishing the context in which the highways were launched and in consolidating certain trends along the way.

Obstacles

The Policy Rules storyline is motivated strongly by multiple crises at the outset (2010). These crises appear to some extent as obstacles in the opening period, specifically the challenges to firm, competent governance of the EU as an integrated entity, e.g. *Economic Competition Fragments Unity and Weak Governance*. These challenges are exacerbated by the spatial heterogeneity of environmental as well as political conditions in the EU. EU citizens experience very different socio-political and environmental contexts, which appear to grade along North-South and East-West axes, e.g. the obstacle *Different Natural Conditions North/South*. This latter obstacle translates into very different challenges to water quality and, especially, quantity, which cannot be redressed by uniform EU policies. When this challenge is combined with the on-going problem of *Low Public Awareness* of the environment, climate change or policy, then policy formulation and implementation cannot be facilitated 'bottom-up' by an informed and engaged public. This latter problem of lack of education and engagement by the public sets up a path dependence on leadership from above. And this inertia is exacerbated by another source of path dependence, e.g. the obstacle *Sunk Costs of Infrastructure = Path Dependence blocking Experiments with Alternative [policies, technologies, practices]*. In brief, with centuries of investment in existing infrastructure dominating the physical, political and financial landscape, it seems impossible to mobilize the extra resources needed (money, skills) to imagine, test and implement alternative solutions to sustainable water supply.

While few in number these obstacles primed the pump for the major impetus of the Policy Rules storyline. Namely, the European Commission pushed forward to try to politically and economically integrate the EU as a political entity that can hold its weight on the international stage with the USA, Russia and China. The challenge of sustainably managing water quality and quantity in the face of global change is one of many that the EU will struggle to achieve as it integrates itself in the process.

Opportunities

The Institutions highway starts with an opportunity, *EU Governance Trend – Streamline Decision Making with Majority Rule*, that the participants felt would help the EU avoid political obstruction by individual nations or minority cliques. This was posited as a necessary step toward political union that would open the door to the many compromises needed to achieve sustainable water management. Two opportunities were suggested by the participants at the mid-point (2030) that stimulated a groundswell of public acceptance of the need to integrate and take forceful action toward sustainable water management. The first, *Climate Change Crisis is clear and convincing*, provided the evidence of clear and present danger to society and ecosystems that cannot be ignored or avoided and demands significant, large-scale response by all EU nations. Given how much political controversy swirled around uncertainty about the science and the evidence itself, when weather trends dramatically shift it releases a proportionately dramatic political response from the public, strengthening the public will for significant commitments in policy and practice. This opportunity is complemented by evidence that government actions can be effective, e.g. *Remediation is immediate and convincing, generates public support*. The combination of climatic extremes clearly communicating the need with effective government policy demonstrating one set of means gives great impetus to the converging of the public (Institutions) and private (Economy) highways in a partnership to jointly achieve the endpoint. These trends are supported by a new opportunity in 2040 that clearly shows the limits of following 20th century industrial solutions dependent on fossil fuels. The opportunity, *Energy Price Rise Stimulates Interest in Ecosystem Services*, opens political and scientific inquiry to search for the services that fossil fuels had partially replaced. The need to de-carbonize the

economy at the same time that services are sustained that used to depend on carbon energizes the search for alternatives and stimulates experimentation with policies that are more adaptive in achieving sustainable water management.

4.5.4 Milestones

Milestones provided a focus on near-term anticipated events, e.g. WFD river basin management plans as well as on future events that in the long-term would herald successful closure on the desired endpoint, e.g. demonstration of economic success, WFD compliance, etc. Aside from a few stepping stones in the middle, e.g. a Biodiversity Directive and Public Acceptance of WFD Governance, most attention was given to defining the actions and opportunities that would have to come together to achieve these milestones.

In general, more Milestones are found in the Institutional than the Economy highways (Table 2). This difference would increase if the *Loss of Ecosystem Services* had not been assigned to Economy on the basis that it could have an economic impact that would require economic adjustment to mitigate or adapt to this loss. However, it is also possible that institutions would also be modified in response to this loss.

Table 16. Milestones identified along the Institutional and Economy highways during the Policy Rules backcasting exercise.

| Time Period | Milestones | |
|-------------|--|--|
| | Institutions Highway | Economy Highway |
| 2040 - 2050 | 2040: Institutionally appropriate incentives established 2042: Good compliance with WFD 2048: Socially just water distribution rights established. | 2044: Economic Success (water productivity) of water management is obvious. 2042: Water consumption reduced to sustainable levels. 2040: Institutionally appropriate incentives established 2040: Water-saving technology is economically feasible. |
| 2030 - 2040 | 2035: Public acceptance of WFD governance 2030: New EU directive on Waters Biodiversity | |
| 2020 - 2030 | 2020: Water Resources Directive 2020: Integrated Planning at River Basin and Regional levels (intersectoral) achieved | 2020: Loss of ecosystem services noted |
| 2010 - 2020 | 2015: WFD Phase 1 River Basin management plans. | |

Institutions: This highway begins with a milestone, e.g. River basin management plans (2015), which is already recognized and planned for all over the EU as a requirement under the WFD. Then following a strategy to integrate planning at river basin and regional levels (recognized in 2020) this highways proceeds in a series of steps through a number of new directives, e.g. *Water Resources* in 2020 and *Water Biodiversity* in 2030, on the way to *Public Acceptance Of WFD Governance* (2035), *Good Compliance With WFD* (2042) to achieve *Socially Just Water Distribution Rights* (2048) and the endpoint of *Sustainable Resource Management* in 2050.

Economy: If one defines them in a very narrow economic sense, then relatively few milestones punctuate the march along the Economy Highway to the scenario's common endpoint. However, if one incorporates institutions as means to stimulate and refine economic processes, then the entire beginning of the Institutions Highway feeds in and jump starts economic reform and research that eventually increase the economic performance of water technologies so as to achieve the endpoint. Therefore, the impetus created by *River Basin Management Plans* and the *Water Resources Directive* stimulates nations to establish *Water Pricing Reforms* as well as research priorities that eventually change behaviours and create water saving technologies that are economically feasible and sustainable. The following section elucidates the actions linking these milestones in ways that clarify this highway further.

4.5.5 Actions

Actions were the most common unit proposed by participants as stepping stones along the two highways. Of the two highways more actions sustained the momentum of the Economy highway than the Institutions highway (Table 3). However, the braided relations linking the two highways make it difficult to fully separate actions into one or the other avenue. For example, the impetus for water-pricing reforms comes from CAP reform as well as the funding mechanisms nations established to ensure they can comply with the WFD. Furthermore, proof that government institutions can effectively remediate problems like loss of ecosystem services provides a stimulus for revising funding priorities for research.

Table 17. Actions identified along the Institutional and Economy highways during the Policy Rules backcasting exercise.

| Time Period | Institutions Highway | Actions Economy Highway |
|-------------|---|---|
| 2030 - 2040 | 2038: Develop strategies for integrated Urban Water Management. 2035: Capacity building of multiple level water management expertise. 2035: Public participation in adaptive experiments. 2033: Revise research funding priorities toward adaptive experiments 2033: Awareness campaign | 2038: Public investments to improve irrigation technology. 2035: Establish river basin-oriented water management financing system. 2032: Involve private sector in water resources management and supply. |
| 2020 - 2030 | 2030: Solidify political will Entire period: Put into order the national water management information system (monitoring + water supply and water use data bases). | 2028: Introduce user-pays-true-price principle throughout EU. 2025: Water pricing reforms and tariffs for amortization. 2025: Establish water markets in agricultural sectors to encourage efficient distribution of water. 2022: Government funded remediation. 2021: Nations establish funding mechanisms to be able to comply with WFD and other EU directives. 2020: Make water sector investments climate proof |
| 2010 - 2020 | 2013: CAP Reform – water use efficiency as a criteria for agricultural subsidy support. 2015: Put into order the national water management information system (monitoring + water supply and water use data bases). | 2013: CAP Reform – water use efficiency as a criteria for agricultural subsidy support 2013: Rationalization of agricultural subsidy structures |

The following paragraphs detail how, to a certain extent, each highway followed its own sequence of actions. However, key bridges between these highways are noted as well.

Both highways start with an action, e.g. CAP Reform – water use efficiency as a criteria for agricultural subsidy support (2013), which both informs river basin management planning as well as establishment of planning on river basin and regional basis. The Economy Highway sustains CAP reform through *Rationalization Of Agricultural Subsidy Structures* (2015) and then responds to obligations created by EU directives with a series of actions to make water management more economically efficient (2021: Nations establish funding mechanisms to be able to comply with WFD and other EU directives, 2025: *Establish Water Markets In Agricultural Sectors* to encourage efficient distribution of water, 2025: *Water Pricing Reforms And Tariffs For Amortization*; 2028: *Introduce User-Pays-True-Price Principle Throughout EU*. Economic rationalization of the water sector continues with actions in 2032 to *Involve Private Sector In Water Resources Management And Supply* and 2035 to establish *River Basin-Oriented Water Management Financing System*. The final action in 2038, *Public Investments To Improve Irrigation Technology*, are key to establishing the milestones that water saving technology is economically feasible in 2040 and that such public/private partnerships can increase the productivity of water and make it economically successful.

The Institutions highway proceeds by augmenting CAP reform with integrated planning at river basin levels to make water sector investments climate proof (2020). In response to *Loss Of Ecosystem Services*, governance forces marshal the above actions to spearhead *Government Funded Remediation Efforts* (2022). Government

agencies use the *Clear And Convincing Evidence Of Climate Change* as well as *Success Of Remediation Efforts to Solidify Political Will* (2030), which they sustain with an *Awareness Campaign* (2032). These developments translate into greater commitment of financial capital (*Revision of Research Priorities*) and human capital (*Public Participation in Adaptive Experiments*) into adaptive governance that, combined with economic success, promotes *Good Compliance with the Water Framework Directive*.

4.5.6 Summary

Table 18. Summary of the backcasting exercise of Policy Rules.

| Period | 2008 – 2015/2020 | 2015/2020 – 2030 | 2030 – 2050 |
|--------------------------|---|--|--|
| <i>Key Milestones</i> | <ul style="list-style-type: none"> WFD Phase 1 River Basin Management Plans Water Resources Directive Loss of Ecosystem Services Integrated Planning River Basins and Regions | <ul style="list-style-type: none"> New Water Biodiversity Directive | <ul style="list-style-type: none"> Public acceptance of WFD Governance Institutional Appropriate Incentives established Water saving technologies economically feasible Water consumption reduced to sustainable level Good compliance with WFD Achieve good ecol. Status Econ success becomes obvious (water productivity) Socially just water distribution rights established |
| <i>Key Obstacles</i> | <ul style="list-style-type: none"> Heterogeneous natural conditions N/S Europe Weak governance CC impacts masked hinder rally of political will Economic competition fragments EU unity | <ul style="list-style-type: none"> Low awareness Costs sunk in conventional infrastructure create path dependence that hinders experimentation with alternative technologies and policies. | <ul style="list-style-type: none"> Costs sunk in conventional infrastructure create path dependence that hinders experimentation with alternative technologies and policies. |
| <i>Key Opportunities</i> | <ul style="list-style-type: none"> EU governance trend towards streamlining decision-making with Majority Rule | <ul style="list-style-type: none"> Natural remediation is immediate and convincing, generates public support Solidify political will for remediation policy | <ul style="list-style-type: none"> Climate change impacts are clear and convincing Energy price rise stimulates interest in services not reliant on fossil fuels (ecosystem services). |
| <i>Key Actions</i> | <ul style="list-style-type: none"> CAP Reform 2013: water use efficiency a criteria for agricultural support Rationalization of agricultural subsidy structures Make water sector investments climate-proof. | <ul style="list-style-type: none"> Nations establish funding mechanisms to comply with EU directives (WFD and others) Government funded remediation of ecosystem service losses Establish Water markets in agric sectors for efficient water distribution. Tariffs for amortization Water pricing reforms Intro user-pays-true-prices principle throughout EU. | <ul style="list-style-type: none"> Involve private sector in water resource management Establish river basin oriented water management financing system. Capacity building of different level water management expertise. Research funding priorities shifted toward adaptation. Awareness campaign (WFD) Public participation in adaptive experiments and improvement of irrigation technologies to decrease water losses. Dev strategies for integrated urban water management. |

Table 19. Total number of elements in the Policy Rules backcast, grouped by time period.

| <i>Period</i> | 2008 – 2015/2020 | 2015/2020 – 2030 | 2030 – 2050 | 2008 – 2050 |
|----------------------------|------------------|------------------|-------------|-------------|
| <i>Total milestones</i> | 4 | 1 | 8 | 13 |
| <i>Total obstacles</i> | 4 | 1 | 1 | 6 |
| <i>Total opportunities</i> | 1 | 3 | 1 | 5 |
| <i>Total actions</i> | 3 | 6 | 8 | 17 |

4.6 Comparing the four backcasting exercises (SCENES Scenario Team)

Author: Kasper Kok

Below follows a comparison between the four backcasting exercises, looking for communalities and differences as they appear from the results of PEP3. This needs to be distinguished from the results from the last plenary session during the workshop, where PEP members similarly discussed the results. This will be the topic of the next section.

4.6.1 Endpoints

A comparison of backcasts is meaningful only when the endpoints are comparable. All scenario-groups followed the endpoint as defined in plenary to a large extent. The endpoint “Sustainable management, supply and use of water” translated into very similar phrases where ‘sustainable’ and ‘water supply’ were mentioned in three cases; and ‘management’ in two cases. By and large it can be stated that the endpoints as defined by the four groups was very comparable. Interestingly, all groups expanded on the endpoint by adding 1-2 aspects that are crucial because of the contextual storyline. For instance, quality of life (Sustainability Eventually); secure water supply (Fortress Europe); or sufficient water for economic interest (Economy First) are all additions that highlight the underlying storyline. In other words, all groups stated that sustainable water supply has to be viewed through the glasses of the contextual variables. Importantly, in all groups it was made clear from the onset that sustainable water supply is secondary to the main goal of the storyline. The endpoint can thus be read as:

Sustainable water supply as far as possible given that

- quality of life (Sustainability Eventually)
- economic interest (Economy First)
- security for people (Fortress Europe)
- socio-political context (Policy Rules)

is secured first.

4.6.2 Backcasting strategies

Sustainability Eventually (5)

Space, Energy, Climate Change, Institutional, Norms and Values

Fortress Europe (4):

Flooding, Agriculture, Industry, Other

Economy First (4):

Technological approach; International cooperation; Public-private cooperation and new governance; Economic instruments

Policy Rules (2):

Institutions; Economy

Main highways across backcasting exercises:

1. Institutions (SuE; EcF; PoR; fundamental to FoE)

2. Economy (EcF; PoR; noted as absent in SuE)
3. Climate-related (SuE; FoE; extreme events noted as fundamental in PoR)
4. Agriculture (FoE; SuE)

Clearly, most attention in any of the four backcasts is devoted to institutions and institutional change. Where this was expected in the two ‘regional’ backcasts (SuE and FoE), it equally dominates PoR and EcF. It is in line with the conclusions drawn when analysing the storylines, namely that PEP members are more inclined to discuss socio-economic, political, and institutional drivers and prerequisites than biophysical impacts. Agriculture was the sector that was most often discussed in detail (see also key actions).

4.6.3 Key milestones and actions

In practice, the distinction between actions and milestones was not always clear to all PEP members. Because of the fuzzy boundaries, the milestones and actions are combined in the analysis. Below a discussion on a number of common key actions and milestones is given.

Awareness and Education

Awareness raising through education and/or media is mentioned in all four backcasting exercises. There are, however, very strong differences in how, why, what, and when. In Sustainability Eventually awareness raising campaigns start very early on in the scenario, both through education and media. This leads to a raised awareness around 2030. In Policy Rules awareness campaign do not start until 2030 and effects become apparent only towards the end of the scenario period. Interestingly, in Economy First awareness raising is rather important as well, leading to a ‘sufficient awareness’ around 2020. Here clearly awareness serves the goal of getting other measures accepted, or limiting environmental damage by bottom-up initiatives. This holds to a greater extent for Fortress Europe, where education and cultural change are mentioned, but in the context of accepting the newly emerging security focus.

In short, awareness raising takes place in different periods (between 2010 and 2030); is organised by different actors; and has a slightly different goal depending on the context of the storyline. Thus, no backcast can be realised without awareness campaigns, but the timing and execution depend on the future that is developing.

Public-private partnerships

All backcasts provide ample information on institutional change. Common ground is limited, but all have some kind of role for public-private partnerships. This is most evident in Economy First, where public-private cooperation is one of the highways with key milestones in the period 2030-2050. Similarly, in Sustainability Eventually the establishment of the Trust-Based networks is crucial. These networks are strongly influenced by the NGOs and other grassroot organisations, but also include strong public and private partnerships. Also in the policy-driven Policy Rules, the involvement of the private sector is mentioned as key action after 2030. In Fortress Europe, the role of partnerships seems limited.

Common Agricultural Policy (CAP)

In accordance with the importance of strategies on Agriculture, the CAP is explicitly mentioned in all backcasts except Economy First. In Sustainability Eventually, the CAP reform is first mentioned as an opportunity, working towards a key milestone in 2025: decentralisation of CAP. In Policy Rules the CAP reform in 2013 is a key action; in Fortress Europe the same reform is seen as a key opportunity. Thus, despite differences in viewed the changing role of the CAP as action, milestone, or opportunity, its importance is evident across the scenarios.

Biodiversity

All backcasts specifically mention biodiversity (Action Plans; Directive) and related efforts to maintain or increase. Besides water, it is the most central impact in most backcasts.

Water Framework Directive (WFD)

In both Economy First and Fortress Europe, the WFD is failing according to the storylines. It thus comes as no surprise that both backcasts do not make mention of the WFD. In Fortress Europe, a new directive – the Water Security Framework – eventually replaces the WFD. Surprising there is little mention of the WFD in Sustainability Eventually. In fact, the WFD is failing at its first attempt (2015). In fact, in Sustainability Eventually the crucial highway on the development of Trust-based networks is viewed as an essential accompanying strain of actions next to the WFD that succeeds around 2025. Policy Rules is most explicit on the WFD and the road to full compliance (after 2040). Yet, here also a crucial intermediate step of public acceptance of the WFD governance is needed.

In summary, the WFD either fails (EcF); is substantially downgraded (FoE); or can only succeed when accompanied with strong awareness campaigns. Worse, its current timeline is overly optimistic according to all backcasts. Timing of successful implementation depends mostly on the timing of institutional change and behavioural changes.

Conclusion:

There is a surprising number of key actions and milestones that appear in (almost) all backcasts. Despite obvious mismatches in timing, key actor and/or exact focus of the action/milestone, a number of key milestones seem to have potential irrespective of the contextual storyline. Particularly education and awareness raising; efforts to increase public-private partnerships; and the WFD and CAP are important actions that are needed. A common element on timing is that almost invariably all backcasts indicate that it takes longer for actions to take effect than is anticipated at present. For example, in Policy Rules good compliance with the WFD is not achieved until 2042.

4.6.4 Key obstacles and opportunities

Opportunities

As apparent also from the storylines, climate change impacts and their related potential to increase awareness are mentioned in all four backcasts at some point, notably in Policy Rules and Sustainability Eventually – though notably also with a different timing. Other elements common to more than one backcast were:

- CAP reform (FoE, PoR, SuE, see key actions and milestones)
- Technology spread (FoE, EcF)
- EU integration and governance (FoE, EcF, PoR, though meaning very different things)

Obstacles

Again, there are a number of recurring elements in the various backcasts. First and foremost, lack of money is mentioned in all four backcasts as problematic, either in the beginning during the current financial crisis, or in later phases. In none of the backcasts there seem to be sufficient funds to reach the desired endpoint.

Other elements that are mentioned in more than one backcast include:

- Lack of awareness (EcF; SuE; PoR)
- Weak governance early in the scenario (PoR; SuE)
- Climate change (FoE, and other but mostly viewed as an opportunity in other scenarios)

The number of common obstacles and opportunities is likewise surprisingly large. Noteworthy are climate change as key opportunity and lack of money and lack of awareness as key obstacles.

4.6.5 Candidates for robustness

Looking across the results of all backcasts, we can identify a number of opportunities, obstacles, actions, and milestones that are robust to a certain degree. The list includes:

- Institutions (strategy)
- Economy (strategy)
- Agriculture (strategy)

- Awareness raising (action/milestone)
- Public-private partnerships (action/milestone)
- Common Agricultural Policy (action/opportunity)
- (failure of) Water Framework Directive (action/obstacle)
- Climate Change impacts (opportunity)
- Lack of money (obstacle)
- Weak governance (obstacle)

4.7 Summary and comparison of backcasts (PEP members)

4.7.1 How do strategies in one scenario fare in others?

A first step towards defining candidates for robust actions was an exercise in which the effectiveness of backcasts developed within one contextual storyline within the other storylines. We asked PEP members to take their backcast and ask themselves the question “How does our backcast fare within the context of the other storylines?”. These results were presented and discussed in plenary.

Sustainability Eventually

Table 20. Summary of robustness of Sustainability Eventually backcast within the context of the three other storylines

| SuE strategies | Policy Rules | Economy First | Fortress Europe |
|----------------|---|--|--|
| Space | – (regional differences N-W versus S-E?) | – (check spatial planning) | + |
| Energy | + | +/- (endpoint will differ; how about investment costs?) | + |
| | (supergrid but with differences) | | (supergrids; home produced is more important. Danger: vulnerability) |
| Climate | + | – | – |
| | (crisis appears later) | (profit oriented adaptation & mitigation) | (flood control; agriculture is moving) |
| Institutions | 0/- (lack of cohesion policy in SuE) | – (web 2.0 yes) | + |
| | | | (TBNs = local fortresses) |
| Norms & values | + | – (but check actions more careful for overlap!) | – (awareness raising partly fails) |

The backcast as developed within the context of Sustainability Eventually faster than developments in the storyline of Policy Rules. Similarities are large, but there is a substantial timing problem. There is a surprising amount of resonance between the Sustainability Eventually backcast and the Fortress Europe storyline. Particularly the ‘Space’, ‘Energy’, and ‘Institutions’ highways all seem realisable within a Fortress Europe world. Finally, there is very little common ground with the Economy First storyline. Large parts of the Sustainability Eventually backcast would fail when an Economy First world would develop.

In conclusion, Sustainability Eventually strategies are flexible and with an adaptive grassroots approach that would at least partly work in all scenarios, with the exception of Economy First.

Policy Rules

Table 21. Summary of robustness of Policy Rules backcast within the context of the three other storylines

| PoR strategy elements | Fortress Europe | Sustainability Eventually | Economy First |
|--|---------------------------------|---------------------------|---|
| Regulatory system in lead | 1 | 2 | 4 |
| Pilot experiments | 2 | 1 | 2-3 Different focus on efficiency |
| 1. Campaigns (awareness) 2. Education | 2-3 Education is fine | 1 | 3-4 Works but different Training OK Multiple levels Product oriented, more focused |
| Top-bottom integration | 3-4 | 2-3 | 2-3 |
| Strategy adjustments | Clarify security implications | | Clarify econ. impact of env. degradation Add more economic instruments in PoR |

Scale: 1 = good; 4 = bad

The backcast as developed for Policy Rules would fail to a substantial extent in a Economy First future. Within the Fortress Europe scenario important elements (education; pilot experiments) would work, but the crucial top-bottom integration would not. Within Sustainability Eventually most elements of Policy Rules would be successful, again with the exception of the top-bottom integration.

Concluding, the Policy Rules backcast has elements that would work in all other scenarios (awareness campaigns; pilot experiments), but the crucial aspect of top-bottom integration will most likely not succeed in any of the other contexts.

Fortress Europe

Table 22. Summary of robustness of Fortress Europe backcast within the context of the three other storylines

| FoE strategy elements | Policy Rules | Sustainability Eventually | Economy First |
|--|---------------------------------------|--|---------------------------------------|
| shift of agriculture | yes , but different timing | yes , but different timing | yes , but different mechanism |
| stop subsidies on agriculture | no | yes | yes |
| technological investments & innovation | yes , but focus on agriculture | yes | yes , but 'where' is different |
| diversification of energy sector | yes | yes , but different mix | yes |
| Information + early warning system | yes , but policy driven | yes/no , mechanisms are different | yes |
| enforcement | no | no | no |
| education | yes | yes | no |
| split water poor and | no | yes , but dealt with | no |

| | | | |
|----------------------|-----------|------------------|-----------|
| water rich countries | | very differently | |
| industrial decrease | no | yes | no |
| water use intensity | | | |

The backcast as developed for Fortress Europe has some strategy elements that would likely succeed within all other scenario contexts, but an equal amount that would fail in most other scenarios. Importantly, the shift of agriculture resonates with all scenarios, as do technological innovations; the diversification of the energy sector, and the set-up of early warning systems. Overall, the best match seems to be with Sustainability Eventually, the largest mismatches with Economy First.

Economy First

No table was presented. In general, the group concluded that to a very large extent the strategies of the Economy First backcast would work in all other three scenario contexts.

4.7.2 Robust strategies

Table 23. Summary of robustness of backcast within the context of other storylines.

| | | | | |
|------------------|-------------------------------|------------------------------------|--------------------------|------------------------------|
| from/to | FoE | SuE | EcF | PoR |
| FoE | XXX | +/- different mechanisms | +/- | + different focus |
| SuE | + surprisingly well | XXX | - - does not resonate | + SuE moves faster |
| EcF ¹ | + | + | XXX | + |
| PoR | +/0 partly | ++ timing? | - | XXX |

1: assumptions.

Main points from this table:

- Strategies from none of the scenarios work in all other scenarios. That is, none of the overall strategies are robust.
- Where robustness seems present, caution needs to be taken considering crucial issues of underlying mechanisms; focus of the strategy; and timing.
- Yet, all scenarios have strategy elements that work in all other scenarios. That is, candidates for robust highways of actions can be defined
- Strategies from PoR, SuE, and FoE do not seem to work in EcF, while vice versa, strategies from EcF seem to work in all other scenarios.
- PoR and SuE match best.
- Despite the strong focus on security, strategies of other scenarios seem to work well in Fortress Europe.

Considering all presentations and tables within this section, the following potentially robust strategies can be identified:

- Energy (from SuE and FoE)
- Awareness campaigns (from PoR)
- Agricultural shift and phasing out subsidies (from FoE)
- Technological investments (from FoE)
- Early warning systems (from FoE)

4.7.3 Candidates for robust actions identified by PEP members

A vivid discussion lead to a number of actions/strategy elements on which there was consensus that they could be robust over all four storylines. Importantly:

- Pilot experiments from P.R. strategy
- Education – needs to be clarified, a lot of variation

- Water saving strategies
- Better international agreements EU-countries on transboundary issues
- Economic instruments:
 - o pollution taxes (problematic in SuE, especially towards the end)
 - o voluntary agreements (possibly not in FoE)
 - o true water costs/pricing (problematic in SuE, especially towards the end; FoE: pricing works but the timing does not)
- Flood prevention/mitigation

4.8 Final list of robust elements emerging from backcasting exercises

As a last step we compared the analysis made by the SCENES Scenario Team (Section 4.6) and the conclusions on robustness drawn by the PEP members (Section 4.7) to arrive to final list of candidates for robustness.

From tables:

- Energy (from SuE and SuE)
- Awareness campaigns (from PoR)
- Agricultural shift and phasing out subsidies (from FoE)
- Technological investments (from FoE)
- Early warning systems (from FoE)

From Pep members:

- Pilot experiments from P.R. strategy
- Education – needs to be clarified, a lot of variation
- Water saving strategies
- Better international agreements EU-countries on transboundary issues
- Economic instruments:
 - o pollution taxes (problematic in SuE, especially towards the end)
 - o voluntary agreements (possibly not in FoE)
 - o true water costs/pricing (problematic in SuE, especially towards the end; FoE: pricing works but the timing does not)
- Flood prevention/mitigation

Table 24. Final list of robust elements.

| no. | From backcast analyses | From last plenary | From analysis of last plenary |
|-----|--|-----------------------------|-------------------------------|
| 1 | Institutions (strategy) | International agreements | |
| 2 | Economy (strategy) | Economic instruments | |
| 3 | Agriculture (strategy) | | Spatial planning |
| 4 | Awareness raising (action/milestone) | Education | Awareness campaigns |
| 5 | Public-private partnerships (action/milestone) | | |
| 6 | Common Agricultural Policy (action/opportunity) | | Phasing out of subsidies |
| 7 | (failure of) Water Framework Directive (action/obstacle) | | |
| 8 | Climate Change impacts (opportunity) | | |
| 9 | Lack of money (obstacle) | | |
| 10 | Weak governance (obstacle) | | |
| 11 | | Water-saving strategies | |
| 12 | | Pilot experiments | |
| 13 | | Flood prevention/mitigation | Early-warning systems |
| 14 | | | Energy (strategy) |
| 15 | | | Technological investments |

There are a number of interesting conclusions to be drawn from this overview:

1. **The total list of robust elements is rather large with 15 elements.**
2. **Different analysis, different candidates for robustness.** There is only one candidate for robustness that emerged from all three analyses, namely awareness raising. At least two candidates were unique for any of the three analyses.
3. **PEP members focused strongly on water aspects.** The largest number of actions directly related to the water system came from the last discussion with the PEP members.
4. **Overall list covers a variety of sectors, actors, and factors.** The overall list shows a broad set of highly integrated factors, actors and sectors. Emphasis seems to be on Agriculture, Economy, Energy, and Education.
5. **Most elements are rather broadly defined.** On the downside, most elements are rather general in nature, and a more detailed analysis including a discussion with PEP members would be needed to elaborate on details. As mentioned earlier in the Deliverable, details on timing, exact goal, and/or actor sometimes differ substantially, which would lower the effectiveness of any measurement.
6. **Two key obstacles are crucial in the effectiveness of any action.** Crucial seems the robust observation that there is both a lack of financial resources and a lack of institutional power ('weak governance') to execute some of the key actions. Thus, potentially robust measures might be difficult to practically implement.

Despite all differences in scenario, backcast, and timing of individual robust actions, a story seems valid independent from these differences. Note that this story only includes elements of backcasts that are identified as being robust, i.e. the story is valid in any future that might materialise. Because we draw here only from the backcasting exercise, the story also provide vital elements to reach the objective of a sustainable water supply by 2050.

Lack of money and rather weak government/governance structure obstruct any type of structural change. Triggered by extreme events (notably climate change impacts – floodings and droughts), actions to accomplish institutional change by a variety of multi-scale actors, accompanied by large-scale awareness raising campaigns (education and media) can lead to a more sustainable future. The exact emphasis on sectors and factors is partly unclear, but the list should include the energy sector (supergrid; diversification; Action Plans), agriculture (first through the CAP; later also more bottom-up), and the economy (pollution taxes; and importantly water pricing). The shift from government to governance includes a prominent role for private-public partnerships. Even if all these changes are set in motion as soon as possible, compliance with the Water Framework Directive will be very difficult at best; failure of the current WFD being more plausible. The WFD is replaced by other initiatives of which details differ depending on the future outlook.

5 Pilot Area and regional enrichment - results from the IA2 meeting

Authors: various

This chapter deals with the results of a meeting that took place 12-14 April in Tallinn, Estonia with representatives of all Pilot Areas of SCENES. During this meeting first the results of all Pilot Area backcasting workshops were presented. For a full description of these results we refer to Deliverable IA2.3. A meta analysis is presented in Deliverable 2.11. The second day of the meeting was mostly devoted to a cross-scale enrichment of the PEP3 backcasting results.

5.1 *Methodological considerations*

Author: Kasper Kok

We suggested a two-step procedure:

1. Upscaling from Pilot Area scale to reduce variability. All Pilot Areas executed a backcasting workshop and each of the four regions of SCENES contains at least 2 Pilot Areas. The amount and variability in the results of these workshops was considered such that a meaningful enrichment of the PEP results would be obstructed. We asked the Pilot Area representatives and regional coordinators to group by region, discuss the results of the Pilot Area workshops and reach a consensus on the main elements of a backcasting at regional scale. The key advice was to look for **communalities**.
2. Enrich PEP3 backcasts and robust strategies based on the consensus reached during step 1. Important elements were considered: Who? (can this be the same actor in our region?); When? (does timing fit with regional backcast); How long? (can results be achieved over same period of time); and What? (is the focus the same?) The key advice was the look for **differences**.

In practice, the two steps were not followed exactly in most regions. Details will be explained in the subsequent sections.

5.2 *Mediterranean region*

Main responsible: Consuelo Varela Ortega

The Mediterranean region is the largest and most diverse region, and with three Pilot Areas it also covers a wide variety of issues. This was consequently the region where the proposed two-step method was followed most closely. The three Pilot Areas are Candelaro (southern Italy); Guadiana (Spain); Seyhan (Turkey). The below slightly edited text received from the regional coordinator.

5.2.1 Step 1. Cross-scale comparison of Pilot Area backcasting exercises

Scenarios

The following scenarios were developed during the first and second Pilot Area workshop:

Candelaro:

- Policy Rules
- Fortress Europe

Seyhan:

- Sustainability Eventually

Guadiana:

- Policy Rules + Economy First
- Policy Rules + Sustainability Eventually

Thus, Economy First and Fortress Europe were developed in only one Pilot Area; none of the scenarios was developed in all three Pilot Areas.

Endpoints of backcasting exercises

- Guadiana: Good status of water ecosystems compatible with socio-economic viability
- Candelaro: Adequate water availability for the future in agriculture
- Seyhan: Realization of sustainable irrigation (2030)

Same goal for the three basins: Candelaro and Seyhan focus mainly on quantity but they both included quality and environmental sustainability issues. “Adequate” implies adequate quantity and quality.

Reformulated goal for the Mediterranean region:

Sustainable (environmental and socio-economic) water use in rural areas

In the three pilot areas, the backcasting was focused on the relationship water-agriculture. In some Pilot Area other sectors were also considered, but the crucial theme in all Pilot Areas was the impact of water scarcity on irrigated agriculture, and vice-versa.

The tables below show the main actions and milestones identified as common for all Mediterranean Pilot Area for each scenario. When one scenario has been developed only in one PA, main actions and milestones have been taken for that PA alone. Specifically, for each scenario we have taken:

- Sustainability eventually: Guadiana (combined Policy + Sustainability) and Seyhan
- Policy rules: Guadiana (key policy elements from the 2 combined scenarios Policy + Sustainability and Policy + Economy) and Candelaro
- Fortress Europe: Candelaro
- Economy first: Guadiana (combined Policy + Economy)

Table 25-28. Key milestones and key actions in the four Mediterranean regional backcasts.

| SUSTAINABILITY EVENTUALLY (Seyhan + Guadiana P+S) | |
|--|--|
| <p>Key Milestones:</p> <ul style="list-style-type: none"> - 2014: Price of irrigation water increases drastically - 2018: Improve water management: coercive control - 2020: Rational and coherent management and planning - 2022: Turkey start to benefit from international financing opportunities for infrastructural investments - 2025: Water savings in agriculture - 2027: Environmental flow requirements are attained - 2028: Pressurized and prepaid systems are set up - 2030: Developments of rural tourism - 2035: Stabilization of population - 2043: Good status of water bodies maintained - 2048: Environmental democracy - 2048: Landscape and land use diversity | <p>Key actions:</p> <ul style="list-style-type: none"> - 2010: Capacity building for NGOs in irrigation sector - 2011: Water saving treated as an agricultural support policy - 2012: Promote water saving with stakeholder involvement and rewards - 2012: Centralized water agency but decentralized water management - 2018: change in agricultural subsidy policies - 2018: encourage rainfed agriculture - 2023: Installation of local stations to determine crop water requirements using IT - 2017: Trained technicians reached the farmers - 2019: Project development training to finance infrastructural investments - 2028: Central pressurized distribution and field level pre-paid systems installed - 2035: payments for environmental services - 2042: value and reward of multifunctional agriculture |

| POLICY RULES (Candelaro + Guadiana P+E and P+S) | |
|--|--|
| <p>Key milestones</p> <ul style="list-style-type: none"> - Sensitized society - Major water use efficiency - 2018: Re-use of unconventional water - 2025: Rational and coherent management and planning - Sustainable use of groundwater - Increased reservoir capacity - 2020: Improved water management - 2038: Balance agriculture-sustainability | <p>Key actions</p> <ul style="list-style-type: none"> - 2018: Waste water treatment and re-use - 2012-2024: Efficient control of policy compliance - 2019: Incentive policies for using GFP - 2018: Increase of financing for a more efficient water management - 2014: Public campaigns for education and awareness - 2014: Technical assistance. |

| FORTRESS EUROPE (Candelaro) | |
|--|--|
| <p>Key milestones:</p> <ul style="list-style-type: none"> - 2040: Increased surface water availability - 2035: Sustainable use of the aquifers - 2030: Optimized water use in agriculture - 2030: Transparent model of governance of other water sources (aquifers; waste water) - 2015: Addressed applied research - 2015: Increased level of awareness | <p>Key actions</p> <ul style="list-style-type: none"> - 2040: Development and modernization of infrastructures - 2040: Unconventional water use - 2035-2040: Consolidation of farm management and business know how - 2030: Water requirements and market driven cropping patterns - 2030: Technical assistance to optimize irrigation variables - 2030: Genetic improvement - 2025: Information and education campaigns - 2025: Territorial monitoring - 2015: Addressing of investments: human resources and plans - 2040: Sustainable development policies (management, renewable energy) - 2035: Demand oriented policy - 2025: Synergy among research entities in territorial management - 2015: Climate change driven agronomic plans - 2010: New planning policies <p>The main actors are politicians, producers and consumers. The main sectors involved are water, agriculture, agro food industry, infrastructures and energy.</p> |

| ECONOMY FIRST (Guadiana P+E) | |
|--|--|
| <p>Key milestones:</p> <ul style="list-style-type: none"> - 2030: Good status of water ecosystems - 2030: Establishment of new industrial activities - 2028: More profitable crops - 2025: Youth arrival to rural areas - 2025: Strengthening organic agriculture - 2025: High water productivity crops - 2025: Diversification of rural livelihoods - 2022: More efficient water resources management - 2020: Tourism development environmentally friendly - 2020: Increased valuation of the crops' energy component (use of agricultural sub-products) - 2020: Development of local markets - 2015: Further integration between agricultural and environmental policies | <p>Key actions:</p> <ul style="list-style-type: none"> - 2025: Financial support to local agro-industries - 2020: Payments for environmentally friendly agricultural activities - 2018: Waste water treatment and reuse - 2018: Fiscal incentives for bio-fuels production - 2017: Incentives + town planning for rural villages' conservation - 2015: Efficient control and monitoring - 2012: Punishment of non-friendly with the environment practices - 2012: Education & training for new market developments and better marketing in agriculture |

5.2.2 Step 2. Enrichment of PEP3 backcasting results

Sustainability Eventually

PEP Goal: **Sustainable water supply minimising trade-offs between different aspects of quality of life**

Mediterranean Goal: **Sustainable (environmental and socio-economic) water use in rural areas**

The table below comprises the main actions and milestones identified during the backcasting in the PEP policy scenario group. We have highlighted in blue the elements that are present in the Mediterranean perspective (in one or some of the PA backcasting results, for the policy scenario).

Table 29. Main actions and milestones from the Sustainability Eventually PEP backcast. Highlighted in blue are important elements for the Mediterranean.

| | 2008 – 2015/2020 | 2015/2020 – 2030 | 2030 – 2050 |
|-----------------------|---|---|--|
| <i>Key milestones</i> | <ul style="list-style-type: none"> • Holistic education • Goal for renewable energy met | <ul style="list-style-type: none"> • TBNs established • Awareness raised | <ul style="list-style-type: none"> • TBNs leading • Coordinated supergrid established • 90% green energy • Consumer behaviour changed |
| <i>Key actions</i> | <ul style="list-style-type: none"> • Strict emission targets • Integrated policies for water • Start grassroot movements | <ul style="list-style-type: none"> • Floodplain management introduced at all scales • Transport coordination by region • Accompanying | <ul style="list-style-type: none"> • Sustainable Consumption and production – higher policy targets • Renewable energy new policy options |

| | | | |
|--|---|-------------------------------|--|
| | <ul style="list-style-type: none"> • Stop green space use for ag. and industry | measures for spatial planning | <ul style="list-style-type: none"> • Implementation of sustainable strategy |
|--|---|-------------------------------|--|

General comments:

PEP3 focused on sustainability but the emphasis is on water supply rather than demand. Quality of life is not mentioned much in regional goals.

The PEP3 SuE scenario starts with multiple-crises which is not the case for Mediterranean region. This reflects the difference in the conception of PEP and PA panels. PEP considers the current situation as “Pareto optimal” and they think that to deviate from status quo significant shocks are required.

Fully decentralized governance structure may turn out to be an obstacle for the final objective. Decentralization is supply driven. The changing governance structure due to multiple crises brings about TBNs but individual incentives are totally ignored in the process.

The demand side is implicitly included in “norms and values” highway but again individual incentives are substituted with actions such as holistic training and new types of media. Sustainable consumer behaviour is again maintained by multiple-crisis and disasters etc.

Key milestones from the Mediterranean region:

- 2014: Price of irrigation water increases drastically
- 2018: Improve water management: coercive control
- 2020: Rational and coherent management and planning
- 2022: Turkey start to benefit from international financing opportunities for infrastructural investments
- 2025: Water savings in agriculture
- 2027: Environmental flow requirements are attained
- 2028: Pressurized and prepaid systems are set up
- 2030: Developments of rural tourism
- 2035: Stabilization of population
- 2043: Good status of water bodies maintained
- 2048: Environmental democracy
- 2048: Landscape and land use diversity

Key actions from the Mediterranean region:

- 2010: Capacity building for NGOs in irrigation sector
- 2011: Water saving treated as an agricultural support policy
- 2012: Promote water saving with stakeholder involvement and rewards
- 2012: Centralized water agency but decentralized water management
- 2018: Change in agricultural subsidy policies
- 2018: Encourage rain-fed agriculture
- 2023: Installation of local stations to determine crop water requirements using IT
- 2017: Trained technicians reached the farmers
- 2019: Project development training to finance infrastructural investments
- 2028: Central pressurized distribution and field level pre-paid systems installed
- 2035: Payments for environmental services
- 2042: Value and reward of multifunctional agriculture

Policy Rules

PEP Goal: **Sustainable water supply minimising trade-offs between different aspects of quality of life**

Mediterranean Goal: **Sustainable (environmental and socio-economic) water use in rural areas**

Key milestones in the Mediterranean region

Sensitized society; major water use efficiency; re-use of unconventional water; Rational and coherent management and planning; sustainable use of groundwater; increased reservoir capacity; improved water management; Balance agriculture sustainability.

Key actions in the Mediterranean region:

Waste water treatment and re-use; efficient control of policy compliance; incentive policies for using Good Farming Practices; increase of financing for a more efficient water management; public campaigns for education and awareness; technical assistance.

The table below comprises the main actions and milestones identified during the backcasting in the PEP policy scenario group. We have highlighted in blue the elements that are present in the Mediterranean perspective (in one or some of the PA backcasting results, for the policy scenario).

Table 30. Main actions and milestones from the Policy Rules PEP backcast. Highlighted in blue are important elements for the Mediterranean.

| Period | 2008 – 2015/2020 | 2015/2020 – 2030 | 2030 – 2050 |
|----------------|---|--|--|
| Key Milestones | <ul style="list-style-type: none"> • WFD Phase 1 River Basin Management Plans • Water Resources Directive • Loss of Ecosystem Services • Integrated Planning River Basins and Regions | <ul style="list-style-type: none"> • New Water Biodiversity Directive | <ul style="list-style-type: none"> • Public acceptance of WFD Governance • Institutional Appropriate Incentives established • Water saving technologies economically feasible • Water consumption reduced to sustainable level • Good compliance with WFD • Achieve good ecol. Status • Econ success becomes obvious (water productivity) • Socially just water distribution rights established |
| Key Actions | <ul style="list-style-type: none"> • CAP Reform 2013: water use efficiency a criteria for agricultural support • Rationalization of agricultural subsidy structures • Make water sector investments climate-proof. | <ul style="list-style-type: none"> • Nations establish funding mechanisms to comply with EU directives (WFD and others) • Government funded remediation of ecosystem service losses • Establish Water markets in agric sectors for efficient water distribution. • Tariffs for amortization • Water pricing reforms • Intro user-pays-true-prices principle throughout EU. | <ul style="list-style-type: none"> • Involve private sector in water resource management • Establish river basin oriented water management financing system. • Capacity building of different level water management expertise. • Research funding priorities shifted toward adaptation. • Awareness campaign (WFD) • Public participation in adaptive experiments and improvement of irrigation technologies to decrease water losses. • Dev strategies for integrated urban water management. |

Comments to other milestones/actions:

- Reform of the agricultural policy → in the regional perspective, the reform is also present, linked to water savings and the implementation of good agricultural practices in general. In the Guadiana, it is meant to be also focused on social criteria, but always trying not to encourage high water consuming crops.

- Economic elements also appear in some of the PA panels, very related to the improvement of management and governance, together with the coordination of policies (agricultural and water policies, and policies at the different levels: national, regional, European)
- Urban water is not an issue, no milestones or actions are related to it.
- No mention to the involvement of private sector in water management in the regional perspective.
- There is an emphasis on the compliance with the objectives of the WFD, but a complementary Biodiversity Directive is not mentioned.
- Public campaigns for the awareness of WFD importance is not included in the regional version, but something very related is the campaigns for education and awareness, which are connected with the environmental values.

In general, no contradictions are found between the PEP results and the regional vision.

Fortress Europe

PEP Goal: Secure water supply

Mediterranean Goal: Sustainable (environmental and socio-economic) water use in rural areas

Table 31. Main actions and milestones from the Fortress Europe PEP backcast. Highlighted in blue are important elements for the Mediterranean.

| <i>Period</i> | 2008 – 2015/2020 | 2015/2020 – 2030 | 2030 – 2050 |
|---------------------------------------|---|---|--|
| <i>Key Milestones (PEP-Candelaro)</i> | <ul style="list-style-type: none"> • Changed CAP and other agriculture EU policies • Security Thread (trigger for scenario) • Changed industrial policy | <ul style="list-style-type: none"> • EU flood Defence Agency in place, • Irrigation system in place • Change energy production policy | <ul style="list-style-type: none"> • Good water supply • Flood warning systems and defence infra in place • Improved efficiency in industry • Good drinking water quality |
| <i>Key Actions (PEP-Candelaro)</i> | <ul style="list-style-type: none"> • Development of secure flood policy, • Education • Planning good (security focussed) budget | <ul style="list-style-type: none"> • Flood defence infrastructure • Stop subsidies for water demanding crops, • Encourage agriculture in water rich areas, • Policy for abandoned lands | <ul style="list-style-type: none"> • Management and maintenance of flood warning and defence systems • Strong control system for implementation of SAP. • Improve water supply infrastructure (agri, industry, drinking, etc.) |
| <i>Obstacles/opportunities</i> | <ul style="list-style-type: none"> • Conflicts among sectors | | <ul style="list-style-type: none"> • Climate change • Secure agricultural policy |

Key actions in the Mediterranean region:

- 2010: New planning policies
- 2015: Climate change driven agronomic plans
- 2015: Addressing of investments: human resources and plans
- 2025: Synergy among research entities in territorial management
- 2025: Information and education campaigns
- 2025: Territorial monitoring
- 2030: Water requirements and market driven cropping patterns
- 2030: Technical assistance to optimize irrigation variables
- 2030: Genetic improvement
- 2035: Demand oriented policy
- 2035-2040: Consolidation of farm management and business know how
- 2040: Unconventional water use
- 2040: Development and modernization of infrastructures
- 2040: Sustainable development policies (management, renewable energy)

Key milestones in the Mediterranean region:

- 2015: Addressed applied research
- 2015: Increased level of awareness
- 2030: Optimized water use in agriculture
- 2030: Transparent model of governance of other water sources (aquifers; waste water)
- 2035: Sustainable use of the aquifers
- 2040: Increased surface water availability

There are some common obstacles/opportunities in the PEP and in the Mediterranean backcasting results that we would like to mention:

- Conflicts among sectors (short term)
- Climate change (long term)
- Secure agricultural policy (long term)

Other comments

A general good water supply according to PEP3 is achieved through the encouragement of agriculture in water rich areas (northern) and an increase of the supply for agriculture resulting from an improved efficiency in industry. This doesn't apply to the Mediterranean in general which is an agricultural region and where industry is not developed. The objective, instead, can be reached by developing the missing infrastructures (developing plans), by applying new farming systems (new varieties, deficit irrigation, new technologies), by re-using unconventional water resources and by an appropriate governance system.

This comes out from the WS held with the stakeholders instead of proposing the change of a region vocation (agriculture).

Moreover water is not the only limitation for agriculture production.

Economy First

The table below comprises all the actions and milestones identified during the backcasting in the PEP economy first scenario group. We have highlighted in blue the elements that are common to the Mediterranean perspective (Guadiana PA) for the economy first scenario.

Table 32. Main actions and milestones from the Economy First PEP backcast. Highlighted in blue are important elements for the Mediterranean.

| Period | 2008 – 2015/2020 | 2015/2020 – 2030 | 2030 – 2050 |
|----------------|--|--|--|
| Key Milestones | | <p>TECHNOLOGICAL APPROACH TO PROBLEM SOLVING</p> <ul style="list-style-type: none"> 2028: Set up of the monitoring of the state of the environment 2018: Maintained (current) biodiversity <p>INTERNATIONAL COOPERATION</p> <ul style="list-style-type: none"> 2025: Cross-border cooperation is working out <p>PUBLIC-PRIVATE COOPERATION AND NEW GOVERNANCE</p> <ul style="list-style-type: none"> 2025: Sufficient awareness of public and stakeholders | <p>TECHNOLOGICAL APPROACH TO PROBLEM SOLVING</p> <ul style="list-style-type: none"> 2045: Efficient water management & supply 2045: Sufficient water quality for health 2045: Little impact of flood and drought 2045: Restored biodiversity 2045: Access to drinking water 2035: Amenities are kept for public use 2030: Importance of water quality 2030: Amenities are kept for public use (water access) <p>PUBLIC-PRIVATE COOPERATION AND NEW GOVERNANCE</p> <ul style="list-style-type: none"> 2045: Equitable access to water goods 2040: Public-private partnerships start to emerge 2030: Involvement of stakeholders 2030: New governance <p>ECONOMIC INSTRUMENTS</p> <ul style="list-style-type: none"> 2045: Sufficient water quality for economic interests 2030: Importance of water quality |
| Key Actions | <p>TECHNOLOGICAL APPROACH TO PROBLEM SOLVING</p> <ul style="list-style-type: none"> 2015: New water supplies 2015: To create | <p>TECHNOLOGICAL APPROACH TO PROBLEM SOLVING</p> <ul style="list-style-type: none"> 2025: Technical training for farmers 2025: Introduction of pre-treatment | <p>TECHNOLOGICAL APPROACH TO PROBLEM SOLVING</p> <ul style="list-style-type: none"> 2030: Change in technologies |

| Period | 2008 – 2015/2020 | 2015/2020 – 2030 | 2030 – 2050 |
|--------|--|--|---|
| | national parks for biodiversity protection INTERNATIONAL COOPERATION • 2012: Cross-border cooperation PUBLIC-PRIVATE COOPERATION • 2015: Awareness rising measures ECONOMIC INSTRUMENTS • 2015: pollution taxes • 2015: Labelling of products • 2015: Emission taxes on products • 2012: Involvement of government investments • 2012: Emission payments and taxes | technology • 2025: Setting up monitoring • 2020: research (private companies) PUBLIC-PRIVATE COOPERATION • 2025: Increasing capacities of public management authorities • 2025: Land-use planning regulation • 2020: Market approaches in campaigns ECONOMIC INSTRUMENTS • 2025: Decrease public subsidies for agriculture • 2025: Water price for agriculture • 2025: Taxes, voluntary agreements | PUBLIC-PRIVATE COOPERATION • 2035: Adaptation measures driven by stakeholders • 2030: Establishing regulations • 2030: Policies and restoration activities ECONOMIC INSTRUMENTS • 2035: Introduction of support to poor people |

Main differences:

Relevant issues in PEP not present in the Mediterranean region

- 2012: Cross-border cooperation
- 2015: Awareness rising measures
- 2025: Water price for agriculture
- 2012: Emission payments and taxes

Elements in conflict with the Mediterranean perspective

- 2030: Establishing regulations: this is a too vague action. What kind of regulations? What is the purpose?
- 2015: Labelling of products: we don't find it relevant for the proposed goal

Relevant elements in the Mediterranean perspective missing in the PEP backcasting:

Milestones

- 2030: Establishment of new industrial activities
- 2025: Youth arrival to rural areas
- 2025: Strengthening organic agriculture
- 2025: High water productivity crops
- 2025: Diversification of rural livelihoods
- 2020: Tourism development environmentally friendly
- 2020: Energetic revaluation of crops (use of agricultural sub-products)
- 2020: Development of local markets

- 2015: Further integration between agricultural and environmental policies

Actions

- 2025: Financial support to local agro-industries
- 2020: Payments for environmentally friendly agricultural activities

5.3 *Baltic region*

Workgroup: Kristīna Veidemane, Edgars Bojārs, Arvo Iital, Marek Gielczewski, Minna Kaljonen

5.3.1 Step 1. Cross-scale comparison of Pilot Area backcasting exercises

The Baltic region is the only region in which a regional panel was established and a series of scenario development workshops was executed, following the Pilot Area methodology. Thus, a regional perspective was formulated during the third regional workshop (see Deliverable IA2.3), which build on the results obtained in the two Pilot Areas in the region. Step 1 was logically skipped.

5.3.2 Step 2. Enrichment of PEP3 backcasting results

Endpoint

Table 33. Overview of endpoints selected by the PEP, highlighting elements important for the Baltic region.

| | |
|-----------------------------|--|
| Eastern Baltic Region - all | <u>Good water status by 2050 for all freshwaters</u> |
| Pan-Europe - EcF | <u>Sufficient water in all of Europe:</u> Efficient water supply and management; restored biodiversity; sufficient water quality for health and economic interest; (No) Improved equitable access (differs for regions); Are we willing to accept new standards in water quality? Fewer chemicals can be addressed (short list); Little impacts of floods and draughts. |
| Pan-Europe - SuE | <u>Sustainable water supply minimising trade-offs between different aspects of quality of life</u> With 'water supply' both water quality and water quantity are covered, as lowering water quality will negatively influence water availability. |
| Pan-Europe - FoE | <u>Sustainable management of a secure water supply</u> Enough water, of a good enough quality, for agriculture, industry, power, drinking water. |
| Pan-Europe - PoR | <u>Sustainable water resources management</u> The principal goal - sustainably provide acceptable levels of water quantity and quality in the EU in the socio-political context where policy has a leadership role in setting society's development path. |

CONCLUSION: The **end point** of the Eastern Baltic backcasting complies with the endpoints of all four Pan-European backcasting outcomes, although mostly not directly mentioned in the PEP endpoints, the water quality is included in all of them.

Obstacles

Table 34. Overview of main obstacles from the PEP backcasts and similarities with the Baltic.

| Scenario | Obstacle | Comments |
|-------------------------|--|--|
| Pan-Europe – EcF | (Lack of) Little public money | |
| | Lobbies of private companies | |
| | Urbanisation and urban sprawl | In line with the Eastern Baltic |
| | Lack of monitoring | |
| | Social tensions | |
| Pan-Europe – SuE | Financial crisis | |
| | Early failure of the WFD (2015) | Opposite to the Baltic scenario where WFD is being successfully implemented |
| | Dominant role of the mass media | |
| Pan-Europe – FoE | Lack of money | In line with the Eastern Baltic |
| | Limited technology transfer | Partly in line with the Eastern Baltic |
| | Deterioration of irrigation infrastructure | |
| | Limited technology transfer | |
| | Water stress in some areas | |
| | Climate change | |
| Pan-Europe – PoR | Heterogeneous natural conditions N/S Europe | That should be specified, in which way this acts as an obstacle, e.g., difficulties to implement common policies over Europe |
| | Weak governance | |
| | CC impacts masked hinder rally of political will | |
| | Economic competition fragments EU unity | |
| | Low awareness | |
| | Costs sunk in conventional infrastructure create path dependence that hinders experimentation with alternative technologies and policies | |
| | | |

Opportunities

Table 35. Overview of main opportunities from the PEP backcasts and similarities with the Baltic

| Scenario | Opportunity | Comments |
|------------------|--|---|
| Pan-Europe – EcF | Technologies spread quickly | In line with the Eastern Baltic |
| | Different economic incentives can be introduced | In line with the Eastern Baltic |
| | Access to global market | |
| Pan-Europe – SuE | The multiple crises | Opposite to the Eastern Baltic |
| | The weakening of the EU | Opposite to the Eastern Baltic |
| | Possibilities offered by Web 2.0 (and 3.0) for training and education | In line with the Eastern Baltic |
| Pan-Europe – FoE | CAP 2012 reform | Partly in line with the Eastern Baltic (focus on organic farming) |
| | Current technology development in Europe | |
| | Stronger EU institutions | In line with the Eastern Baltic |
| Pan-Europe – PoR | EU integration | |
| | Secure Agricultural Policy | |
| | EU governance trend towards streamlining decision-making with Majority Rule | |
| | Natural remediation is immediate and convincing, generates public support | |
| | Solidify political will for remediation policy | |
| | Climate change impacts are clear and convincing | |
| | Energy price rise stimulates interest in services not reliant on fossil fuels (ecosystem services) | |

Actions

Table 36. Overview of main actions from the PEP backcasts and similarities with the Baltic

| Scenario | Action | Comments |
|------------------|---|---------------------------------|
| Pan-Europe – EcF | Research | |
| | Change in technologies | In line with the Eastern Baltic |
| | Setting up monitoring | |
| | Introduction of pre-treatment technology | |
| | New water supplies | |
| | Land-use planning regulation | In line with the Eastern Baltic |
| | Cross-border cooperation | In line with the Eastern Baltic |
| | Awareness rising measures | In line with the Eastern Baltic |
| | Market approaches in campaigns | In line with the Eastern Baltic |
| | Adaptation measures driven by stakeholders | |
| | Create national parks for biodiversity protection | |
| | Policies and restoration activities | |
| | Emission payments and taxes | In line with the Eastern Baltic |
| | Involvement of government investments | |
| | Pollution taxes | |
| Pan-Europe – SuE | Taxes, voluntary Agreements | |
| | Emission taxes on products | |
| | Investments in sustainable agriculture (EU and stakeholders) through technology | |
| | Policy Option Target Setting on renewable energy | |
| | Development of new techniques | |
| | Implementation of sustainable strategy (regions) | |

| | | |
|-------------------------|---|--|
| | Sustainable Consumption and production higher policy target | |
| | Accompanying measures on spatial planning | |
| | Policy Option Target Setting on renewable energy | |
| | Eco-engineering for sewage, industry and Heavily Modified Water Bodies | |
| | Broad discussion on sustainable strategy (regions) | |
| | Enforce current SCP plan across Europe | |
| | Rural development plans integrated (EU and regional) | |
| | Transport coordination (regions) | |
| | Integrated water policies | |
| | Investments in RTD | |
| | Training teachers and experts | |
| | Investments in agricultural technology (pan-Europe) | |
| | Strict emission targets 40g CO2/km (EU) | |
| | Start grassroots local media | |
| | Local and regional markets protected at EU level (new legislation, trading etc.) | |
| | Investments in railroads | |
| | Open media education for civic society | |
| | New limitations for use of space for urban and industrial development | |
| | Implementation of new standards and norms for RE | May qualify as in line with the Eastern Baltic scenario (setting specific criteria for “good water status” in the Baltic scenario) |
| | Long-term integrated landscape-based monitoring and assessment | |
| | New standards in constructions and new technology | |
| | Implementation of CCS | |
| | Strategy Plan (new energy + adaptation + mitigation) | |
| Pan-Europe – FoE | Flooding: Management maintenance | |
| | Control system for policy implementation for agriculture | Partly in line with the Eastern Baltic |
| | Improve water supply infrastructure | In line with the Eastern Baltic |
| | Redefine infrastructure and warning system for flooding | |
| | Impose import regulations | |
| | Research and regulations technology development | |
| | Build/improve defensive infrastructure against floods | |
| | Research: - centralize agricultural research (alternative crops, different strands, etc.) - new agricultural practices, changes crops on less water , regional and socially stable | Partly in line with the Eastern Baltic |
| | Establish requirements for use of best available technology (water efficient) | |
| | Improve monitoring & data collection | In line with the Eastern Baltic |
| | Bring Ukraine in the European Union | |
| | Building in floodplains is forbidden | |
| | Develop food processing sector in new agricultural areas | |
| | Develop secure flood policy | |
| | Encourage small –medium size agriculture in | Partly in line with the Eastern Baltic |

| | | |
|-------------------------|--|--|
| | water rich areas | |
| | Planning good budget (part of SFP) | |
| | Develop policy for abandoned lands | Partly in line with the Eastern Baltic |
| | New R&D policy for abandoned lands | Partly in line with the Eastern Baltic |
| | Build and reconstruct irrigation, drainage and water distribution systems, especially in water rich regions. | Opposite to the Eastern Baltic |
| | Stop subsidies on water demanding crops, especially in water poor regions. | |
| | Look for good agricultural production areas in Pan-Europe | |
| | Education: - introduction of new lifestyle by education and knowledge dissemination - involving stakeholders in changes - build capacity with stakeholders (at all levels) - to deal with obstacles and use opportunities | Partly in line with the Eastern Baltic |
| Pan-Europe – PoR | CAP Reform 2013: water use efficiency a criteria for agricultural support | In line with the Eastern Baltic |
| | Rationalization of agricultural subsidy structures | In line with the Eastern Baltic |
| | Make water sector investments climate-proof | |
| | Nations establish funding mechanisms to comply with EU directives (WFD and others) | In line with the Eastern Baltic |
| | Government funded remediation of ecosystem service losses | Partly in line with the Eastern Baltic |
| | Establish Water markets in agric sectors for efficient water distribution | |
| | Tariffs for amortization | In line with the Eastern Baltic |
| | Water pricing reforms | In line with the Eastern Baltic |
| | Intro user-pays-true-prices principle throughout EU | In line with the Eastern Baltic |
| | Involve private sector in water resource management | Partly in line with the Eastern Baltic |
| | Establish river basin oriented water management financing system | In line with the Eastern Baltic |
| | Capacity building of different level water management expertise | In line with the Eastern Baltic |
| | Research funding priorities shifted toward adaptation | In line with the Eastern Baltic |
| | Awareness campaign (WFD) | In line with the Eastern Baltic |
| | Public participation in adaptive experiments and improvement of irrigation technologies to decrease water losses | |
| | Developing strategies for integrated urban water management | In line with the Eastern Baltic |

Overall conclusion

For Pan-European level:

- The Pan-European scenarios lack energy sector development issues, which are stressed in the Eastern Baltic scenarios.
- The Pan-European scenarios do not address the issue of time of recovery which is needed by ecosystems to improve the situation.

For Eastern Baltic Region:

- The Eastern Baltic Region back casting results lack policy development issues. They are more targeted to the sectors as key drivers influencing the water system.
- The Eastern Baltic Region and its pilot areas are mostly perceived as “closed systems” and have too little connection with external drivers such as climate change, global markets.

5.4 Black Sea region

Main responsible: Olga Zhovtonog

5.4.1 Step 1a. Cross-scale comparison of Pilot Area backcasting exercises

End points

Crimea – Efficient use of water for food production

Lower Don – Surface water quality complies with certain standards

Comparison of main issues, story lines and backcasting results:

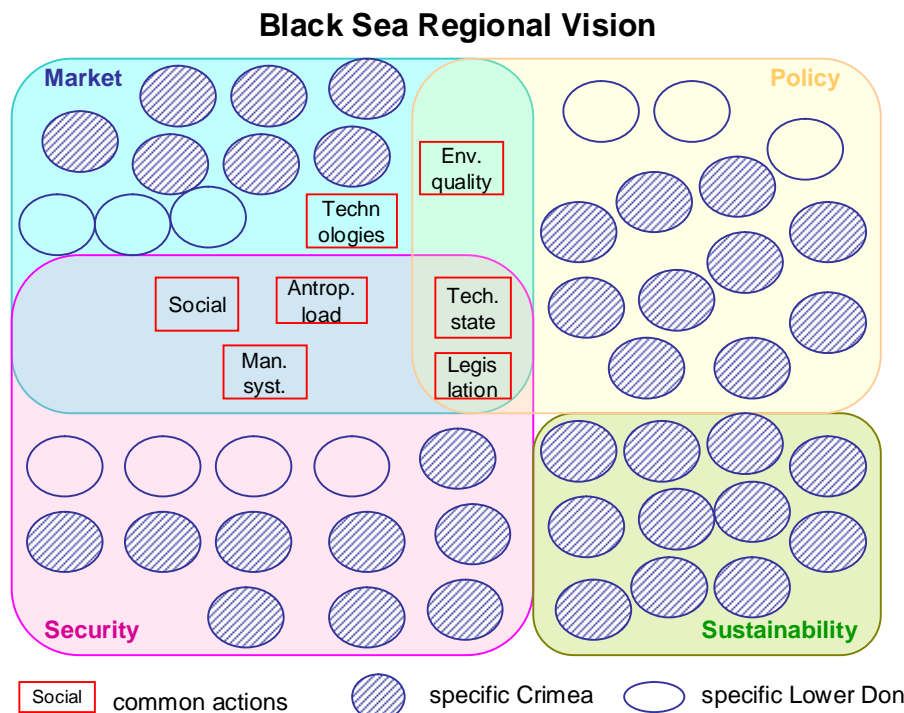


Figure 13. Schematic overview of Black Sea regional vision, indicating main areas of interest, specific actions for the Crimea and Lower Don Pilot Areas, and robust actions.

Comparison per scenario of the main issues on Crimea and Low Don pilot area - differences and similarities

Market First scenario

Table 37. Overview of important issues in Crimea and Lower Don Pilot Area in Markets First, together with similarities

| <u>Regional driving forces</u> | <u>Crimea</u> | <u>Similar issues</u> |
|---|---|--|
| <ul style="list-style-type: none"> • International and national policy • Growing of GDP • Investments • Climate change • Population change | <ul style="list-style-type: none"> • Property • Finances • Information • Water price • External factors • Political stability • Staff availability <p><u>Lower Don</u></p> <ul style="list-style-type: none"> • Watershed state • Water resources availability • Climate change | <ul style="list-style-type: none"> • Technical state of water infrastructure • Environment quality • Anthropogenic loads by different sectors of economy • Water resource management • Technologies • Legislation • Society |

Policy first scenario

Table 38. Overview of important issues in Crimea and Lower Don Pilot Area in Policy First, together with similarities

| <u>Regional driving forces</u> | <u>Crimea</u> | <u>Similar issues</u> |
|--|---|--|
| <ul style="list-style-type: none"> • International and national policy • Growing of GDP • Investments • Climate change • Population | <ul style="list-style-type: none"> • Qualified staff availability • Financing • Decentralised integrated water management • Local and external markets development • Education and awareness • Ecological production industry • Monitoring • World economy • Government policy • Local and external markets development | <ul style="list-style-type: none"> • Technical state of water infrastructure • Water quality • State of ecosystems and nature protection • Legislation |
| | <u>Lower Don</u> <ul style="list-style-type: none"> • Watershed state • Water resources availability • Climate change • Anthropogenic load on water bodies | |

Security first scenario

Table 39. Overview of important issues in Crimea and Lower Don Pilot Area in Markets First, together with similarities

| <u>Regional driving forces</u> | <u>Crimea</u> | <u>Similar issues</u> |
|--|--|--|
| <ul style="list-style-type: none"> • International and national policy • Growing of GDP • Investments • Climate change • Population | <ul style="list-style-type: none"> • Self-government • Dangerous factors and products • Policy and government • Self-protection • Financing Limits and tariffs • Social conflicts • Unexpected events (emergencies) • Conflicts between sectors: agriculture, industry, public service | <ul style="list-style-type: none"> • Technical state of water infrastructure • Environment quality • Anthropogenic loads by different sectors of economy • Water resource management • Technologies • Legislation • Society |
| | <u>Lower Don</u> <ul style="list-style-type: none"> • Watershed state • Water resources availability • Climate change • Bioresources and water ecosystems | |

Results of comparison:

- In general more differences than similarities
- Sustainability scenario selected only for Crimea
- Legislation and technical state of water infrastructure are common issues in three scenarios - MF,PF, SeF
- Legislation, technical state of water infrastructure, role of society, water management, anthropogenic loads by economic sectors are common for MF and SeF scenarios
- Legislation, technical state and environment quality are common issues for MF and PF
- For MF scenario the common issues are legislation, technical state of water infrastructure, technologies

5.4.2 Step 1b. Towards a regional vision

Red – policy , legislation and regulations

Blue – infrastructure

Pink – technologies

Green – ecological state, environment protection and education, social issues

Yellow – economical financial issues

Market First

Table 40. Overview of elements of the Black Sea regional backcast for Markets First

| Milestones | |
|-------------------|---|
| 2040 | – Water management according to the international standards |
| 2030 | – Modernised water infrastructure (in Ukraine – large-scale irrigation systems) – Implemented technologies for water management |
| 2020 | – Implemented effective legislation (in Ukraine – IWRM, WFD) – Implemented effective economic mechanisms – In Ukraine – investment projects (WB, EBRD, etc.) |
| 2015/2010 | – Legislation developed – In Ukraine open land market – New markets |
| Obstacles | |
| 2040 | Due to lack of regulatory policy after restoration and modernization of water infrastructure and growing of agriculture production and manufacturing competition for water between sectors can be observed. This can later lead to unsatisfactory conditions of water infrastructure due to decreasing of investments in it operation and maintenance |
| 2030 | Deterioration of geopolitical situation and complication in transboundary rivers management Lack of financial support from government Lack of some technical assets and means in water sector |
| 2020 | Lack of effective monitoring system and control measures on water resources use Lack of cooperation between water management institutions |
| 2015 | Consequences of global economic crises Not complete and efficient legislation Lack of correspondence of water legislation with respect to the European one |
| Actions | |
| 2040 | – Implementation of resource-efficient and environmentally friendly technologies in agriculture, industry, etc. – Implementation of economical measures stimulating modern water treatment technologies |
| 2030 | – Modernisation and reconstruction of infrastructure of irrigation systems, hydraulic structures and municipal services – Improvement of water use payment system and payment for water management services (in Russia – water use by water transport; in Ukraine – technological market) |
| 2020 | – Public-private cooperation and lobby of new markets development through the government – In Ukraine – development and implementation of IWRM system |
| 2015/2010 | – Strengthening the water policy concerning the control of water use – In Ukraine – approval of the package of the land laws and opening the land market – In Ukraine – feasibility study for rehabilitation of water infrastructure |

Policy first

Table 41. Overview of elements of the Black Sea regional backcast for Policy First

| Milestones | |
|-------------------|---|
| 2040 - 2030 | <ul style="list-style-type: none"> • Creation of a new type of international integration of Ukraine and Russia within a new enhanced type of European Union for cooperation in economical spheres, nature resource use, ecotourism • Implementation of adaptive environmentally save technologies in agriculture and other sectors according to the agrolandscape typology • Implementation of integrated water resources management and WFD in Ukraine and complex water protection legislation in Russia • Improvement of public health and increase of life duration • Modernisation of water infrastructure and functioning of ecological monitoring and audit |
| 2030 | <ul style="list-style-type: none"> • Development of international cooperation and integration into the world community • Development of education in environment protection issues and provision of European level of expertise of water resource specialists • Implementation of environmentally safe technologies in agriculture |
| 2020 | <ul style="list-style-type: none"> • Improvement of legislation according to international standards and development of regional programs in water and agriculture sectors • Designed projects of modernisation and rehabilitation of large scale water infrastructure in Ukraine and reconstruction of water treatment facilities in Russia • Educational system complies with international standards |
| 2015/2010 | <ul style="list-style-type: none"> • Implementation of new government programs in water and agriculture sectors • Harmonisation of Ukrainian policy and legislation to the European standards |
| Obstacles | |
| 2040 | <ul style="list-style-type: none"> • In Ukraine lack of markets for food products and unstable political situation followed by lack of government financing and private investments as well as lack of technical means and assets • Lack of coordination in water and land use |
| 2030 | <ul style="list-style-type: none"> • Outdated technologies • Problems in water management in rural areas (in river basins) • Low priorities of agriculture in Russia |
| 2020 | <ul style="list-style-type: none"> • Economical difficulties and low priority of agriculture • Corruption and passivity of population |
| 2010 | <ul style="list-style-type: none"> • High level of anthropogenic loads on water bodies and poor level of water treatment in Russia • Food quality does not follow international standards in Ukraine • Insufficient legislation in water sector • Lack of knowledge and experiences in reforming of water sector and development of new policy and its implementation • Low level of public environmental education |
| Actions | |
| 2040 | <ul style="list-style-type: none"> • Creation of new decentralised water management institutions in Ukraine (Water boards, Water and land users associations) on all level • Development of financial mechanisms for ecological monitoring • Implementation of complex investments projects in water infrastructure and land consolidation • State control on food quality in Ukraine |

| | |
|-----------|---|
| 2030 | <ul style="list-style-type: none"> • Legislation enforcement and stick control of following of international agreements • Education of water specialists and active public involvement • Introduction of organic farming |
| 2020 | <ul style="list-style-type: none"> • Classification of water bodies • Development of legislation and new taxation regimes • Implementation of modern technologies (circulating water supply , environment save pesticides, new treatment facilities) |
| 2015/2010 | <ul style="list-style-type: none"> • Development and improvement of policy (strategies and programs, creation of RD fund) in rural development, water and agriculture sectors (good agriculture practice, Integration of <i>Water and Land Codes</i>) • Opening of land market and creation of Land bank in Ukraine |

Security first

Table 42. Overview of elements of the Black Sea regional backcast for Security First

| Milestones | |
|-------------|---|
| 2040 - 2030 | <ul style="list-style-type: none"> • Operation and maintenance of irrigation systems in Crimea on 300 000 ha • Improvement of water treatment up to certain standards , good quality state of local water courses • Effective control and coordination in water management (implementation of IWRM in Ukraine) • Environmental education |
| 2030 | <ul style="list-style-type: none"> • Implementation of new water treatment technologies in Russia • Separation of effluents (storm and waste water) |
| 2020 | <ul style="list-style-type: none"> • Introduction of strong dictatorship • Complete reconstruction of irrigation systems in Crimea • Improvement of legislation (property rights) and institutions (operational water boards) in Crimea • Functioning of monitoring system for strengthening control <ul style="list-style-type: none"> • Due to strict controls in water quality and nature protection - development of tourism in Crimea |
| 2015/2010 | <ul style="list-style-type: none"> • Strong regional developments in Crimea with local policy in water sector • Development of energy saving and energy control policy (alternative energy sources, energy audit certification and efficient assessment in energy sector) |
| Obstacles | |
| 2040 | <ul style="list-style-type: none"> • Climate change • Overheads for high technical level support • Misbalance in pricing policy of different regions • Disunity in sectors priorities |
| 2020-2025 | <ul style="list-style-type: none"> • Epidemiological hazards, system ecological and political crisis • Technical problems • Disunity in sectors priorities, conflict of interests, increase of social tension due to unreliable information • Lack of touristic infrastructure • Disunity in sectors priorities |
| 2010 | <ul style="list-style-type: none"> • Incomplete legislation development and lack of law enforcement mechanisms |

| | |
|----------------|--|
| | <ul style="list-style-type: none"> • Bad technical condition (or deterioration) of infrastructure • Employment in water sector is not prestigious • Lack of vision and social perspectives |
| Actions | |
| 2040 | <ul style="list-style-type: none"> • Implementation of new technologies • Improvement of direct cooperation between consumers and producers |
| 2030 | <ul style="list-style-type: none"> • Development and implementation of new legislation • Increase of taxation |
| 2020 | <ul style="list-style-type: none"> • Application of a strong political will • Strengthening of coordination and increasing of bureaucracy • Development of projects on reconstruction and modernisation of water infrastructure • Development of touristic infrastructure in Crimea |
| 2015/2010 | <ul style="list-style-type: none"> • Implementation of WFD and other EU directives in Crimea • Improvement of land cadastre system in Crimea • Establishment of the centre for regional development • Antimonopoly campaign in Crimea • Increase of graduates from water related faculties • Formulation of a national idea in Ukraine |

Sustainability First scenario for Crimea

(This scenario was not elaborated in Lower Don Pilot Area)

Table 43. Overview of elements of the Black Sea regional backcast for Sustainability First

| | |
|-------------------|---|
| Milestones | |
| 2040 | <ul style="list-style-type: none"> • Legislative base |
| 2030 | <ul style="list-style-type: none"> • Good water quality |
| Actions | |
| 2040 | <ul style="list-style-type: none"> • Establishment of farmers associations for joint use of irrigated lands • Financing from the government and investors • Balance of ownership types • Reconstruction, modernisation and optimisation of water infrastructure |
| 2030 | <ul style="list-style-type: none"> • Planning (crop rotation, zoning, etc.) • Water quality improvement campaigns • Programme for water sector development |
| 2020 | <ul style="list-style-type: none"> • Legislation on land and water resources managing • Water quality control • Regulatory and legal framework. • Staff training |
| 2010 | <ul style="list-style-type: none"> • Public awareness raising • Ecological monitoring • Analysis of the technical state of water infrastructure |

5.4.3 Step 2. Enrichment of PEP3 backcasting results

The below provides the results of the PEP3 meeting as in Section 4; colours highlighting changes as suggested by the Baltic region.

Market first

TECHNOLOGICAL APPROACH TO PROBLEM SOLVING

Endpoints: Sufficient water quality for economic interests (2045), Sufficient water quality for health (2045), Efficient water management & supply (2045), Little impact of floods and droughts (2045), Equitable access to water goods (2045), Access to drinking water (2045), Restored Biodiversity (2045)

Key actions: research (2020) and change in technologies (resource-efficient and environmentally friendly technologies) (2030), Setting up monitoring (2025), Introduction of pre-treatment technology (2025), New water supplies (2015), Land-use planning regulation (2025)

Key milestones: Set up of the monitoring of the state of the environment (2030), Amenities are kept for public use (2030); Amenities are kept for public use – water access (2035), Maintained (current) biodiversity (2018)

Key actors: central and local government, private companies

INTERNATIONAL COOPERATION

endpoints: Sufficient water quality for economic interests (2045), Sufficient water quality for health (2045)

key actions: Cross-border cooperation (2015), investment projects in large-scale irrigation infrastructure in Ukraine (WB, EBRD, etc.) (2020), cooperation for development of new markets

key milestones: Cross-border cooperation (with non-EU countries) is worked out (2025)

key obstacles: Deterioration of geopolitical situation, transboundary rivers management issues

key actors: central and local government, private companies

PUBLIC-PRIVATE COOPERATION AND NEW GOVERNANCE

endpoints: Sufficient water quality for economic interests (2045), Sufficient water quality for health (2045), Efficient water management & supply (2045), Little impact of flood and drought (2045), Equitable access to water goods (2045), Access to drinking water (2045), Restored Biodiversity (2045)

key actions: Awareness rising measures (2018), Market approaches in campaigns (2020), Adaptation measures driven by stakeholders (2035), create national parks for biodiversity protection (2015), Policies and restoration activities (2030), private sector in Ukraine approaches new markets through the national government (2020)

key milestones: Sufficient awareness of public and stakeholders (2025), New governance (2030) and Public-private partnerships start to emerge (2040)

key actors: central and local government, private companies, society

ECONOMIC INSTRUMENTS

endpoints: Sufficient water quality for economic interests (2045), Sufficient water quality for health (2045), Efficient water management & supply (2045), Little impact of floods and droughts (2045), Equitable access to water goods (2045), Access to clean drinking water (2045), Restored Biodiversity (2045), in Ukraine water is a good and adoption of the “polluter pays” principle (2040)

key actions: Emission payments and taxes (2012), Involvement of government investments (2012), pollution taxes (2015), Taxes, voluntary agreements (2025), Emission taxes on products (2015), Improvement of water use payment system and payment for water management services (in Russia – water use by water transport; in Ukraine – technological market) (2030), in Ukraine introduction of co-financing mechanisms (governmental subsidies & private investments) (2020),

key milestones: Importance of water quality (2030), water banks (2030)

key actors: central and local government, private companies

Policy first

Table 44. Overview of Milestones in the Policy Rules PEP backcast and additions from the Black Sea

| Time Period | Milestones | |
|-------------|---|--|
| | Institutions Highway | Economy Highway |
| 2040 - 2050 | <p>2040: Institutionally appropriate incentives established</p> <p>2042: Good compliance with WFD</p> <p>2048: Socially just water distribution rights established.</p> | <p>2044: Economic Success (water productivity) of water management is obvious.</p> <p>2042: Water consumption reduced to sustainable levels.</p> <p>2040: Institutionally appropriate incentives established</p> <p>2040: Water-saving technology is economically feasible.</p> <p>2040: Implementation of adaptive land and water management technologies to protect agro landscapes and develop ecotourism</p> |
| 2030 - 2040 | <p>2040: Creation of new type of European integration enhanced towards the East, including Ukraine and Russia</p> <p>2040: Implementation of WFD in Ukraine and complex water protection in Russia</p> <p>2040: improvement of public health and increase of life duration</p> <p>2035: Public acceptance of WFD governance</p> <p>2030: Strengthening of international cooperation and increasing of integration to the world community</p> <p>2030: New EU directive on Waters Biodiversity</p> <p>2030: Environment education system with European level of expertise of water resources specialists</p> | <p>2030: Environment save technologies in agriculture</p> <p>2030: Enterprises use the most advanced technologies</p> |
| 2020 - 2030 | <p>2020: Water Resources Directive</p> <p>2020: Integrated Planning at River Basin and Regional levels (inter-sectoral) achieved</p> <p>2020: Harmonised water policy , education system to international legislation and standards</p> | <p>2020: Loss of ecosystem services noted</p> <p>2020: Government financing of implementation of programs in water and agriculture sector</p> <p>2020: Implementation in the regions of government programs in water and agriculture sector , development and protection of local water resources, ecological monitoring</p> <p>2020: Development and start of implementation of design projects on rehabilitation and modernisation of water infrastructure</p> |
| 2010 - 2020 | <p>2015: WFD Phase 1 River Basin management plans.</p> <p>2010: Introduction of further harmonisation of water policy with international standards</p> <p>2010: Start of implementation of state programs in water sector and RD on the period till 2020</p> | |

Institutions: This highway begins with a milestone, e.g. river basin management plans (2015), which are already in work all over the EU as required by the WFD. Then following a strategy to integrate planning at river basin and regional levels (recognized in 2020) this highways proceeds in a series of steps through a number of new directives, e.g. *Water Resources* in 2020 and *Water Biodiversity* in 2030, on the way to *Public Acceptance of WFD Governance* (2035), *Good Compliance With WFD* (2042) to achieve *Socially Just Water Distribution Rights* (2048) and the endpoint of *Sustainable Resource Management* in 2050. **The highway institutional development for the Black Sea region will strengthen the environment and integrate components in policy, legislation and education, functioning of governmental ecological monitoring and audit (2040-2030), harmonisation of policy and legislation with international standards (2010-2020).**

Economy: If one defines it in a very narrow economic sense, then relatively few milestones punctuate the march along the Economy Highway to the scenario's common endpoint. However, if one incorporates institutions as means to stimulate and refine economic processes, then the entire beginning of the Institutional Highway feeds in and jumps on economic reforms and research that eventually increase the economic performance of water technologies so as to achieve the endpoint. Therefore, the impetus created by *River Basin Management Plans* and the *Water Resources Directive* stimulates nations to establish *Water Pricing Reforms* as well as research priorities that eventually change behaviours and create water saving technologies that are economically feasible and sustainable. The following section elucidates the actions linking these milestones in ways that clarify this highway further.

In economy high way the following particularities are observed for policy first scenario in Black sea region:

- **implementation of more environment friendly technologies;**
- **modernisation and rehabilitation of water infrastructure;**
- **development and protection of local water resources**

Table 45. Overview of Actions in the Policy Rules PEP backcast and additions from the Black Sea

| Time Period | Actions | |
|-------------|--|---|
| | Institutions Highway | Economy Highway |
| 2030 - 2040 | <p>2040: Increased export opportunities for food due to the strengthening of state control on food quality in Ukraine</p> <p>2040: Establishment of new public institutions in IWRM on local level in Ukraine</p> <p>2038: Develop strategies for integrated Urban Water Management.</p> <p>2035: Capacity building of multiple level water management expertise.</p> <p>2035: Public participation in adaptive experiments.</p> <p>2033: Revise research funding priorities toward adaptive experiments</p> <p>2033: Awareness campaign</p> | <p>2040: Realisation of complex investment projects in water and land development in rural areas in Ukraine on the base of public private partnership with strong control of the government</p> <p>2038: Public investments to improve irrigation technology.</p> <p>2035: Establish river basin-oriented water management financing system.</p> <p>2032: Involve private sector in water resources management and supply.</p> |
| 2020 - 2030 | <p>2030: Solidify political will over the entire period: Put into order the national water management information system (monitoring + water supply and water use data bases).</p> <p>2030: Active public involvement</p> <p>2030 Strengthening of government and public control on implementation</p> | <p>2030 : Enhancing of organic agriculture</p> <p>2028: Introduce user-pays-true-price principle throughout EU.</p> <p>2025: Water pricing reforms and tariffs for amortization.</p> <p>2025: Establish water markets in agricultural sectors to encourage efficient distribution of water.</p> <p>2022: Government funded remediation.</p> |

| | | |
|-------------|--|--|
| | <p>for legislation</p> <p>2030: Improvement of education system in water sector</p> | <p>2021: Nations establish funding mechanisms to be able to comply with WFD and other EU directives.</p> <p>2020: Make water sector investments climate proof</p> <p>2020: implementation of innovative technologies, environmentally friendly pesticides</p> |
| 2010 - 2020 | <p>2013: CAP Reform – water use efficiency as a criterion for agricultural subsidy support.</p> <p>2015: Development and improvement of policy, legislation , government programs on water economy</p> <p>2015 Implementation of government programs on education and knowledge dissemination</p> <p>2015: Put into order the national water management information system (monitoring + water supply and water use data bases).</p> <p>2010- 2015:integration of water and Land code, opening of the land market and creation of a Land bank in Ukraine</p> | <p>2015: Design and implementation of the projects for modernisation and rehabilitation of large scale irrigation systems in Ukraine</p> <p>2015: Development of standards for good agriculture practice in Ukraine according to EU requirements</p> <p>2013: CAP Reform – water use efficiency as a criteria for agricultural subsidy support</p> <p>2013: Rationalization of agricultural subsidy structures</p> |

Table 46. Overview of elements in the Fortress Europe PEP backcast and additions from the Black Sea

| | 2008 – 2015/2020 | 2015/2020 – 2030 | 2030 – 2050 |
|-------------------|---|---|--|
| Key milestones | Security Threat (trigger for scenario) changed industrial policy changed CAP and other agricultural policies strong water policy & development in Crimea development of energy saving, audits, controls and alternatives | EU flood Defense Agency in place, irrigation system in place change energy production policy new water treatment technologies in Russia storm water and waste water separation complete reconstruction of irrigate. Systems in Crimea strong dictatorship better legislation (property rights) and institutions(water boards) in Crimea strong controls and monitoring leading to more tourism in Crimea | flood warning systems and defense infra in place self-sufficiency for all agricultural products improved efficiency in industry good drinking water quality on 300 000 ha irrigation works properly good water treatment according to standards & clean rivers effective IWRM in Ukraine environmental education |
| Key obstacles | lack of money weak legislation development and its enforcement bad infrastructure blue employment in water sector not prestigious lack of social perspectives | limited technology transfer deterioration of irrigation infrastructure lack of money epidemics, ecological and political crisis technical problems disunities about priorities & social tensions due to lacking information lack of touristic infrastructure | limited technology transfer water stress in some areas, climate change, misbalance in regional pricing policy disunity in sectors priorities |
| Key opportunities | CAP 2012 reform current technology development in Europe | stronger EU institutions EU integration start of Secure Agricultural Policy | stronger EU institutions EU integration Secure Agricultural Policy |
| Key actions | development of secure flood policy, education planning good (security focused) budget implementation of WFD a.o. EU directives in Crimea improvement of land cadastre in Crimea establish center f. regional development antimonopoly campaign in Crimea increase of graduates fr. Water related faculties formulation of national idea in UA | flood defense infrastructure stop subsidies for water demanding crops, encourage agriculture in water rich areas, policy for abandoned lands strong political will stronger bureaucracy projects for reconstruction of water infrastructure development of tourism infrastructure | management and maintenance of flood warning and defense systems strong control system for implementation of SAP. improve water supply infrastructure (agri, industry, drinking, etc.) implementation of new technologies good cooperation between producers and consumers |

5.5 Lower Danube region

There are two Pilot Areas in this region, the Lower Tisza and the Danube Delta. Here only results from the Lower Tisza are reported. The method of the third workshop in the Danube Delta differed too much from the suggested backcasting methodology to enable a comparison or enrichment of the PEP results. Where possible elements of the results from the Danube Delta were incorporated; the results as presented here are nevertheless labelled as 'Lower Tisza' rather than 'Lower Danube'. Furthermore, in the Lower Tisza it was decided to elaborate on the preliminary discussion started at the IA2 meeting and use those in a workshop where results of other backcasting exercises was included as well. Thus instead of producing a regional vision based on Pilot Area results, below is a vision for the Lower Tisza based local results with the Pilot Area. The PEP results as such were not discussed during this workshop. Yet, the highways presented in the final backcasts closely follow

the highways developed for Sustainability Eventually. As such, there is a strong link with the Sustainability Eventually backcast.

5.5.1 Step 1. Cross-scale comparison of Pilot Area and local backcasts within the Lower Tisza

Sustainability Eventually

- please note: we have concluded that Sustainability Eventually requires another paradigm so if the measures are drafted in the same paradigm as the other scenarios it is not coherent
- blue: comment on the risks, barriers, impacts

Table 47. Sustainability Eventually backcast from the Lower Tisza.

| TIME | SPACE | ENERGY | CLIMATE | INSTITUTIONAL | NORMS & VALUES |
|------|---|--|--|--|--|
| 2050 | Landscape utilization harmonized with the original landscape structures/functions (ultimate goal) | self-sustaining system (local, regional, national, EU level) – without non renewable fossil fuels and slow renewing biofuels, nuclear energy <i>comment: there is no fossil fuel utilization since it is gone; there are problems with energy supply which induce ranking of utilizations, and self control</i> | Annual balance of water budget Forest (and other ecosystems) has high role in management of water resources and processes | Natural resource governance in light of subsidiary principle; water is controlled by local communities, high level cooperation and communication to reach 100% ecological potential of freshwaters | System inertia is the key driver <i>comment: EU might be a barrier; regional cooperation as well with neighbouring countries; loss of system information and knowledge</i> |
| 2025 | Rehabilitation process towards the 2050 goal | decentralized energy sector | small water cycles are stabilized and supports the natural flow in the revitalized main streams and its branches; forests are connected to the water flow (river beds are more wide and less deep) | main institutional aim to stabilize the river ecological, chemical state; and the hydro morphology to reach 70% ecological potential of freshwaters | paradigm shift at many levels and dimensions to achieve self restricted (modest) living and cooperation instead of competition <i>comment: need careful harmonization with human needs (e.g. housing)</i> |
| 2014 | preservation of existing ecological and landscape structures with high values; plans for revitalization for further areas | Small scale, decentralized energy systems (network independent, but with potential connection to the systems) <i>Comm.: requires capital investment – new financial mechanisms; strong opposition from present market owners/key players)</i> | Small stream revitalization, floodplain revitalization; paradigm shift takes place in water resource management to store the water in all forms (blue, grey, green and virtual water), spatial development main objective is to implement modified RBMP for water retention capacity | New energy systems, change in energy production, management/utilization – main aim to half energy/space/resource consumption at all fields (households, service and production sector) | Religious and other alternative (eco) visions are replacing existing world views <i>Comm.: consumption is not the main goal – sustainable consumption is a tool to maintain society, but not to increase GDP</i> |
| 2010 | survey- ecological landscapes; values | Isolation and passive houses; geo-energy and solar heating programs | Large scale reforestation at water logging; high flood risk areas and mountains | RBMP finished with remodified objectives (water retention and savings) – supported by a new CAP and agricultural rural development national legislation | Opened society for sustainability messages due to the natural disasters New social responsibility for commons (resources, |

| | | | | | |
|---|------------|--|--|--|------------------|
| | | | | | knowledge, etc.) |
| Overall comment: general barrier: globalization; external capital interest; resource and monetary deficits | | | | | |
| Legend: | Milestones | | | | |
| | Action | | | | |

Joined Market first – Fortress Europe and Policy Rules as “Collapsed Europe”

- orange: milestones
- blue : overall risks, main problems or challenges due to the process
- red: ultimate goal which can be achieved in this paradigm

Table 48. Collapsed Europe backcast from the Lower Tisza.

| TIME | SPACE | ENERGY | CLIMATE | INSTITUTIONAL | NORMS & VALUES |
|-------------------------|---|--|--|---|---|
| 2025-2050 | 2050: LANDSCAPE WATER RETENTION CAPACITY IS SERVING PRODUCTION DEMANDS AND BASIC SOCIAL NEEDS 2040: villages, farms disappear; in the cities suburb areas (ghettos) are common with special environmental problems as well – sewage treatment, drinking water supply 2030: unfavourable large scale latifundiums large forest plantations (instead of forest management) | 2040: biomass/ biofuel production in the front, huge competition with food production | 2040: agricultural sector in financial and production crisis and in the hand of large multi- global GMO firms – in the light of climate adaptation CC adaptation financial regimes (trading schemes) are common – benefits are mostly for bank sector and individuals owning the land | 2040: CAP shut done, centralized private food market, with differentiated quality (mass low quality, specialized small amount of high quality food) | Rich can have /rule everything – and can be healthy as well |
| <i>risk /comment:</i> | <i>small % of people own all resources (water, land, forest) it causes conflicts among the owners and between the large owners (individual and private companies) and those excluded from the ownership. Political leadership is not able to tackle these challenges, large social conflicts, state deficits, huge unemployment.</i> | | | | |
| actions/ measures | agglomerations and urbanization – water management challenges | sewage recycling to cool cities | transport and agriculture has to take part in GHG emission reduction at same rate compared to other sectors | increased share of military and defence organizations | norm and value structure is the same – no change most important value is money and profit, competition and speculations (at global scale) |
| supports | private water management companies | climate extremes | innovation | | time (2-3 generation shift) |
| setback | local diversified legislation and management | financial resources/financial crises | lack of adaptation capacity | | educations, media, special large cataclysm |
| institution responsible | municipalities | municipalities, governments | actors /farmers, private sector | government | |
| actions/ measures | | forest plantations (plans and actions) | | management of water problems | |
| supports | | forest lobby and large owners | | social pressure | |
| setback | | food production lobby | | financial problems | |
| institution responsible | | | | private enterprises municipalities | |
| 2010-2025 | 2020: 11 flood polder + Duna-Tisza channel + water dams are implemented 2025: new agri-technologies are introduced at large scale fields (soil water retention capacity increases due to | 2020: system is dominated by CO2 emission trading water /blue energy high proportion (neglected ecological and flow issues) 50%-energy demand reduction in agriculture an other service sectors | 2020: trading schemes for natural resources (including emissions, water) 2020: common CAP & TRADE systems introduced | 2020: efficient EU institutional structures | consumption patters avoiding natural problems (over consumption, neglected resource caps) cont. media and political parties short/narrow minded |

| | | | | | |
|--|---|-----------------------------|---|---|--|
| | integrated land management subsidised by CAP) 2020: functional urban structures are developed and implemented (and operates with the given functions) 2014: new CAP and EU financial plan | due to specific regulations | | | |
| actions/ measures | flood and drought risk maps produced and utilized for business decision as well | | Introduction of common CAP&Trade | | Business orientation in education and media (efficiency, competition) |
| supports | EU legal requirements | | innovation | | labour market |
| setback | competition between developers and service providers | | agricultural sector | | traditional value teachers |
| institution responsible | Ministries and business partners | | EU | | low budgeted educational institutions ministries |
| actions/ measures | RBMP implementation with reduced complexity | | Consultancy firms for CO2trading established, spread | | |
| supports | EU financing structures and monitoring | | global processes | | |
| setback | local national cooperation water awareness | | competition instead of cooperation, large scale global companies | | |
| institution responsible | national and regional water management authorities with reduced private involvement | | private sector | | |
| actions/ measures | implementation of large scale water projects | | | | |
| supports | EU, "concrete lobby" ~ water managers | | | | |
| setback | civic society | | | | |
| institution responsible | government | | | | |
| 2010 | till 2014- land purchase moratorium | | | | |
| actions/ measures | to extend land purchase veto for foreign investments | | 2010 Cancún – Kyoto II. agreement | Cont. loans from international organizations | |
| supports | protectionism | | international agreements | international bank sector and lobby | |
| setback | liberalism | | USA / RU; lack of information, short term thinking, economic interest | international situation (political, financial) | |
| institution responsible | Magyarország /EU Council | | Global level | government | |
| actions/ measures | to exonerate land purchase veto | | | | |
| supports | EU / private interest's lobby groups | | | | |
| setback | national policy and interest | | | | |
| institution responsible | EU/national government | | | | |
| We have water retention capacity for special interest groups – but what we miss, what kind of negative processes will come? | | | | | |
| | ecosystem collapse | | | | |
| | free space for public utilization | | | | |

| | | | | | |
|--|--|--|--|--|--|
| | water retention territories along rivers - eco cleaning capacity | | | | |
| | safe biodiversity level | | | | |
| | high quality food in a safe amount | | | | |
| | access to land for agricultural production of small farms | | | | |
| | disappearing mosaic landscapes | | | | |
| | social exclusion and poverty) | | | | |
| | reduced rural population – unmaintained territories | | | | |
| | local, regional communities | | | | |
| | | | | | |
| | | | | | |
| | Milestones | | | | |
| | Actions | | | | |

5.6 Summary of findings

Author: Kasper Kok

In principle, the comparison of PEP and regional findings is three-dimensional, including scale, scenario, and elements of the backcasting exercise. Below we have made our analysis as much as possible independent from the specifics of a single scenario. Some scenario specific issues are provided in 5.6.1.

The analysis in this section does not include the results from the Lower Danube. For good reasons the results came in too late to be included in the analysis in this Deliverable. To provide some input from the Lower Danube, a first rough indication was included in Table 50. Subsequent analyses will include all four regions of SCENES.

5.6.1 Comparison and enrichment by backcast/scenario

Sustainability Eventually

The backcasting logic of the PEP Sustainability Eventually group was heavily questioned by a number of regions. In the Mediterranean, the key highway ('Institutions') and the crucial role of the Trust-based Networks was opposed as a "fully decentralised governance structure may turn out to be an obstacle". They furthermore noted that in the Mediterranean no external shocks are needed. They thus question both the fundamental argumentation and the driving forces. Similarly, in both the Baltic and the Black Sea region there is virtually no overlap in key actions and milestones, indicating a lack of agreement. Despite a similar starting point (GEO-4 scenarios) and similar methodology, the final backcasting results differ largely between the pan-European and regional level.

Fortress Europe

The overlap between the general logic of Fortress Europe at both scales was partial and sometimes scattered. In the Mediterranean it was noted that particularly key obstacles and opportunities were similar. Yet, a key argumentation of the PEP, increasing agricultural production in the north combined with industrial efficiency, was not in line with developments in the Mediterranean. In the Baltic, many key actions were found to be "partially in line with" developments in the Baltic, while no strong contradictions were present. In the Black Sea, many additional actions and milestones were suggested. In short, backcasts at both scales seem to agree on the underlying causes, the main objective (more security), and partially also on the efforts in certain sectors (e.g.

agriculture). Disagreement is on many of the solutions (other governance system; farming systems, or technology use).

Policy Rules

By and large, the strongest overlap is found within the Policy Rules scenario. In the Mediterranean, it is noted that “no contradictions are found”. In the Baltic, the vast majority of actions is “in line with the Baltic”, and likewise in the Black Sea a relatively small amount of additional actions is suggested. Note also that in the Mediterranean a rather strong focus on ‘policy’ is taken.

Economy First

The backcasting logic of Economy First is overall very similar in PEP and Pilot Areas. However on important details there are differences. In the Mediterranean, it is noted that important aspects are missing from the regional backcast (awareness raising; water pricing for agriculture); while there is disagreements on the role of regulations and product labelling. It is particularly the list of “items missing in the PEP” that is long. In the Baltic the vast majority of actions are “in line with the Baltic”. In the Black Sea, there is a small amount of actions added. In general, it seems that the logic of Economy First is not questioned, the details of implementation are.

In general, for all but one backcast the overall logic and main strategies were not questioned by the Pilot Area and regional perspective. Enrichment was mostly in either adding to or contradicting details of the backcast. The Sustainability Eventually backcast, however, was questioned fundamentally in all regions and strong differences between regional and pan-European products exist. This does not necessarily have consequences for the search for robust elements across scale, except for those strongly related to the Sustainability Eventually backcast.

5.6.2 Endpoints

Mediterranean

Guadiana: Good status of water ecosystems compatible with socio-economic viability
Candelaro: Adequate water availability for the future in agriculture
Seyhan: Realization of sustainable irrigation (2030)

Reformulated goal for the Mediterranean region:

Sustainable (environmental and socio-economic) water use in rural areas.

The backcasting was focused on the relationship water-agriculture. Crucial was the impact of water scarcity on irrigated agriculture.

Baltic

The overall endpoint formulated during the Baltic regional workshop was:

Good water status by 2050 for all freshwaters

The backcasting was focused on water quality and water management.

Black Sea

Crimea – Efficient use of water for food production
Lower Don – surface water quality complies with certain standards

The two Pilot Areas differ in a number of important aspects, including the endpoint. The Crimea is closely related to the Mediterranean goal, whereas the Lower Don is much closer to the Baltic endpoint. A common endpoint was not defined.

Conclusion

Two different endpoints were formulated, one focusing on water quality and one on water quantity. All regions concluded that their endpoints were sufficiently similar to the endpoints of the PEP to enable an enrichment exercise.

5.6.3 Obstacles and opportunities

Baltic

Key obstacles in line with PEP results are:

- Lack of money (FoE)
- Limited technology transfer (FoE)
- Urbanisation and urban sprawl (EcF)

Key opportunities:

- Technology spread
- Economic incentives
- Web 2.0 and 3.0 possibilities
- CAP 2012 reform
- stronger EU institutions

Mediterranean

No specific analysis was carried out to identify obstacles and opportunities

Black Sea

A large number of obstacles were identified, covering a broad list of issues. Among those most often mentioned are:

- Lack of financial support
- Poor (water) infrastructure
- Lack of regulatory policies
- Lack of technologies
- Lack of coordination
- Lack of market access

Opportunities were mostly found in the possibility of the Ukraine joining the EU. Opportunities related to this are:

- Opening of markets
- Implementation of CAP and WFD
- Policy reform
- Technology transfer

In conclusion, there seems to be a widespread congruence between opportunities and obstacles as identified by both PEP and regions.

5.6.4 Robust key actions and key milestones

A full analysis of the regional key actions and milestones across the Pilot Areas and regions is beyond the scope of this Deliverable. Instead we focus on the list of robust findings from PEP3 (see Section 4.8) and how they resonate in the various regions. We looked across the results from the regions and checked how often elements from the list in Section 4.8 were present in the regional backcasts as presented earlier in this chapter. Note that the Lower Danube has been included in Table 50. It is a first rough indication, which has not been taken into account in the analysis itself.

Table 49. Candidates for robustness based on the analysis of the pan-European backcast and their robustness in three regions.

| Candidate for robustness from PEP3 | Mediterranean | Baltic | Black Sea |
|---|---|---|---|
| 1. Institutions + international agreements | Institutional change is not key to the regional backcast. | A lack of connection to global markets in the regional backcast was noted. | International agreements through Ukraine entering the EU are crucial in the regional backcast. |
| 2. Economy (taxes, water pricing, voluntary agreements) | Not often mentioned very specific, but economic feasibility is an underlying given and as such crucial to the backcast | Closely following the elements in the various scenarios: Taxes (EcF); water pricing (PoR); and polluter-paying principle (FoE). | Crucial in Black Sea, but not necessarily following similar solutions. |
| 3. Agriculture (spatial planning) | Agriculture is the crucial section in the Mediterranean. Solutions focused on territorial management and land use planning are mentioned. | Agriculture has importance, but similar solutions are limited to EcF (spatial planning) and FoE. | Crucial in the Black Sea, but solutions differ. Focus is on market access etc. |
| 4. Awareness raising | Education and awareness raising are mentioned in most scenarios but <u>not</u> in EcF | Education and awareness raising are mentioned in most scenarios but <u>not</u> in FoE | Education, awareness raising, and public involvement are important in all backcasts |
| 5. Private-public partnership | Noted as not crucial in the regional backcast | Mentioned specifically only in PoR | Mentioned specifically only in EcF |
| 6. CAP reform | Noted as important in PoR and FoE. Can likewise be assumed instrumental in other backcasts | CAP is seen as rather essential for water quality issues. | Not relevant as Ukraine and Russia are not part of the EU |
| 7. Failure of WFD | The WFD is successful in most backcasts, without initial failure: WFD is successful in PoR. Good status of water bodies in SuE. Good status of water ecosystems (EcF) | Mentioned in SuE and PoR The WFD is successful in some backcasts, without initial failure: Successful implementation (SuE and PoR). WFD less crucial for other two backcasts. | Less relevant as Ukraine and Russia are not part of the EU. Yet, successful implementation mentioned in EcF and FoE, and assumingly in PoR and SuE as well. |
| 8. Climate change impact opportunity | Mixed role: Either viewed as unnecessary element (SuE); obstacle (PoR); or potential driver (FoE), but never as a prerequisite for change. | No connection with climate change was made in the regional backcast, but crises in general are not present in the regional backcast. | Not explicitly mentioned in most backcasts, except FoE where it is an obstacle. |
| 9. Lack of money | Financial constraints are secondary in the regional backcast. | Not mentioned in the regional backcast | Lack of funding is crucial in most backcasts |
| 10. Weak governance | Not considered a main obstacle as such. Yet many actions can be seen as improving governance structures. | Not considered a main obstacle. | Multiple policy measures and reforms are at heart of the regional vision. Lack of regulatory policies and coordination are specifically mentioned. |
| 11. Water-saving strategies | Water-saving strategies are a crucial element of the regional backcast, providing details on: water conservation (PoR); promote water saving through stakeholder involvement (SuE) etc. | Less important in relation to a water quality endpoint. | Not mentioned as such, but often implied by 'water management'. |
| 12. Pilot experiments | Not relevant as the Pilot Areas can be regarded pilot experiments | Not relevant as the Pilot Areas can be regarded pilot experiments | Not relevant as the Pilot Areas can be regarded pilot experiments |
| 13. Flood prevention | Not relevant in relation to the water scarcity endpoint. | Not mentioned as important. Note that it is of importance in the Narew Pilot Area, results of | Not mentioned as important. |

| | | | |
|-------------------------------|--|---|--|
| 14. Energy | Not of major importance to agriculture, except renewables. Mentioned specifically in FoE (renewable energy). | which did not end up being part of the regional backcast. Crucial in the Baltic | Mentioned only in FoE (energy saving and energy control) |
| 15. Technological investments | Very important in the regional backcast with many aspects: investments in infrastructure, training technicians, IT, etc. | Important, but not often mentioned explicitly. | Absolutely crucial to the regional backcast. Many aspects in a variety of sectors involving many actors. |

Table 50. Summary of Table 49.

| Candidate for robustness from PEP3 | Mediterranean | Baltic | Black Sea | Lower Danube |
|---|---------------|--------|-----------|--------------|
| 1. Institutions + international agreements | 0 | 0 | ++ | ++ |
| 2. Economy (taxes, water pricing, voluntary agreements) | + | ++ | + | + |
| 3. Agriculture (spatial planning) | +/++ | + | + | ++ |
| 4. Awareness raising | + | + | ++ | ++ |
| 5. Private-public partnership | 0 | 0 | 0 | 0/+ |
| 6. CAP reform | ++ | +/++ | 0 | + |
| 7. Failure of WFD | -/- | - | -/- | 0/- |
| 8. Climate change impact opportunity | - | 0/- | 0/- | 0 |
| 9. Lack of money | 0/- | 0/- | ++ | + |
| 10. Weak governance | 0/+ | 0 | ++ | 0/+ |
| 11. Water-saving strategies | ++ | 0 | 0/+ | 0 |
| 12. Pilot experiments | 0 | 0 | 0 | 0 |
| 13. Flood prevention | 0 | 0 | 0 | + |
| 14. Energy | 0/+ | ++ | 0 | ++ |
| 15. Technological investments | ++ | + | ++ | 0 |

0 : not important in regional vision; or mentioned in one backcast only

-/- : important but in opposite direction

+: important but with similar tendencies in some of the backcasts only

++ : important and with similar tendencies in all backcasts

There are four groups of elements:

- Robustness extends to all (relevant) regions. From the list of 15 candidates for robustness, there are six that are mentioned with similar tendencies in all regions where that factor is relevant. These are:
 - Economy
 - Agriculture
 - Awareness raising
 - Technological investments
 - Common Agricultural Policy (not relevant in the Black Sea)
 - Water-saving strategies (not important in the Baltic)
- Robustness extends to some regions. Three elements provide a mix message:
 - Institutions and international agreements. Are only important in the Black Sea.
 - Weak governance structures are not mentioned in the Baltic.
 - Energy sector. Not important in the Black Sea.
- Robustness extends to none of the regions. Three elements were mentioned usually fragmentarily, but were not deemed of crucial importance across the Pilot Areas and across the scenarios:
 - Private-public partnerships
 - Flood prevention
 - Pilot experiments
- Robustness is contradicted by all regions. Three elements were consistently deemed important but with tendencies that were opposite to analysis of the pan-European results:
 - WFD is succeeding in terms of RBMPs, good ecological status, leading to full compliance.
 - Climate change does not (and does not need to) trigger changes. Rather it is an obstacle to change.

- c. Lack of money is not a crucial obstacle.

There are thus no less than six elements that are robust across four scenarios and across three regions. To successfully work towards a sustainable future of Europe's freshwaters it seems justifiable to say that (technological and financial) investments in water-saving strategies focusing on the agricultural sector, using the CAP as main instruments will be beneficial irrespective future developments or regional differences. This should be accompanied by a broad spectrum of awareness raising campaigns both through education and training and through the media. Three additional elements might be needed, depending on the region. These seem necessary but might not lead to results in parts of Europe. Results from the Black Sea seem to indicate that certain measures might not be effective in regions outside the EU. Three elements show that there are actions and milestones that might seem effective at European level, but that might not lead to results at a lower scale. Particularly public-private partnerships were not mentioned at regional level. Importantly, the robustness of three elements was contradicted in all regions. In none of the regions climate change was regarded as an opportunity to trigger change; rather it was seen as an obstacle to change. Similarly, lack of money was not regarded an essential obstacle. Perhaps most significant, all regions – including the Black Sea! – were more positive on the possibilities for full compliance with the WFD.

6 Conclusions

6.1 Red Threads

The Red Threads were perceived by the PEP members and SCENES people as very useful. Full storylines of up to 8 pages are a very good means to capture the full temporal, spatial, and functional complexity of the story, but it is close to impossible to use these products as means to communicate the main elements. Interestingly, the PEP members voiced their satisfaction most strongly with the summary in words, while within the SCENES Scenario Team the flow-charts were seen as most insightful. The Red Threads will be used as a main output of the process up until the online discussion, and can be considered as the final version of the storylines of that process.

6.2 PEP3 - backcasting exercise

Process

The process of the third workshop was almost completely according to the suggested agenda. In other words, our strategy to include less subjects and focus almost completely on the backcasting exercise worked very well. PEP members indicated their satisfaction with the process of this workshop, both in terms of treating less subjects and in terms of the backcasting methodology.

Results

The results reflect the satisfaction of the process. In all four groups a full backcasting exercise was executed, resulting in a timeline starting from a commonly defined endpoint with multiple opportunities, obstacles, milestones, and actions that translate in a number of main strategies (or 'highways'). The results were comparable in output and in method, which enabled the (crucial) comparison. A fairly large amount of candidates for robustness were identified.

On the downside, our method aimed at a set of very concrete actions with information on what, who, when, how, why. Lack of time caused most actions to be rather unspecific beyond the when (clearly indicated on the timeline) and what (title of the action). Information on the actor, and the exact manner of execution of the action were rather vague in most cases. Thus, although the backcasting exercises yielded a multitude of elements that are far more concrete than the information present in the storylines, it proved to be less concrete than we had hoped for. An additional meeting would be required to complete these details. Also, some groups indicated that important 'highways' of actions were not fully developed.

6.3 Conclusions on regional enrichment

On the results

- Pilot Area and regional backcasts provided a wealth of detail on a number of candidates for robustness, thus strengthening and detailing the results from the PEP. Information from Section 5.2-5.4 can be used to finalise a detailed list of actions that are robust across scenarios but tailored to each region.
- Pilot Area and regional backcasts provided important information that excludes a number of candidates for robustness. It is encouraging that six elements seem robust across all regions. Yet, more detail on exact elements from the agricultural sector and the economy are needed to test this statement. Particularly interesting are those elements that were not mentioned anywhere in the regions or were contradicted. Focus should be on the possibilities for successful implementation of the WFD, the need for public-private partnerships, and the role of climate change impacts.
- The strong focus on agriculture in all regions might have biased results. The final list of six elements seems heavily biased towards the agricultural sector. The role of the energy sector, industry, and possible financial constraints needs to be further analysed at Pilot Area and regional level.

On the process

- Using the expertise of the SCENES Pilot Area and regional representatives to enrich the PEP backcasts was successful. The two-step procedure was useful both to summarise the Pilot Area results and for the cross-scale enrichment.
- The most important drawback is the fact that the opinion of stakeholders that participated in the backcasting workshop was used only indirectly through the eyes of the SCENES experts. At times it was noted that Pilot Area representatives did not necessarily agree with the consensus reached by the stakeholders. Note that this also indicates that an effort was made to use only the opinion of the stakeholders.

The road ahead

Almost all Pilot Areas are planning a fourth and last workshop, during which results will be disseminated. The results of this cross-scale enrichment analysis as well as a selection of the results of PEP3 will be presented and if possible shortly discussed in a number of Pilot Area workshops.

6.4 Overall conclusions

- The series of PEP workshops was successfully completed with PEP3.
- All main goals that we set out during the first annual meeting of SCENES (including PEP0) were achieved. Storylines were developed and cross-scale enriched. Storylines were quantified by stakeholders, resulting in WaterGAP model runs that were discussed during PEP2 and PEP3, thus completing two cycles of the Story-And-Simulation approach.
- The backcasting exercise – which was highly experimental on a subject as broad as sustainable water use – was successfully executed.
- Cross-scale enrichment did not take place to the extent that we originally envisioned. PEP members did not structurally analyse results from Pilot Area and regional level. However, because of the presence of the regional coordinators from SCENES as PEP members, some regional information and perspectives carried through to the final PEP products.
- An alternative cross-scale enrichment method was successfully implemented. SCENES expert from Pilot Area and regional level enriched products from the PEP during two meetings. This led to enriched storylines (see Deliverable 2.6) and enriched backcasts. Particularly the list of candidates for robustness was enriched with regional information.

7 References

Dreborg, K.H. 1996. The essence of backcasting. *Futures* 28(9): 813-828

Robinson, J. 2003. Future subjunctive: backcasting as social learning, *Futures* 35(8): 839-856.

Quist, J., Vergragt, P.J. 2006. Past and future of backcasting: the shift to stakeholder participation and proposal for a methodological framework, *Futures* 38: 1027-1045.

Vliet, M. van, 2010, Final draft of Pilot Area Conceptual Models and narrative storylines, and including a list of short term policy options, SCENES Deliverable 2.11, Wageningen University, Wageningen