



# Multi-scale, participatory, qualitative scenario development

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Pre-conference day  
SCENES water scenarios - final results  
Budapest, 23 March 2011





# Content

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- Background, overall objectives
- **Multi-scale** design
- **Participatory** methodology
- **Qualitative** scenario development:
  - Pan-European methods & results (stories)
  - Pilot Area methods & results (FCMs!)
- Cross-scale enrichment
- Overall conclusions & recommendations





# Background – main partners

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Main partners (in WP2):

- Wageningen University, the Netherlands (Mathijs van Vliet)
- IIASA, Austria (Jan Sendzimir, Ania Dubel)
- CESR, Kassel, Germany (Ilona Baerlund, Martina Floerke)

Close collaboration with:

- SYKE, Finland (WP5)
- All local partners (especially Consuelo Varela, Zsuzsa Flachner, Olga Zhovtonog, Kristina Veidemane)





# Scenario development - overall goals

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- To develop innovative cross-scale scenario development **methodologies** (at pan-European, regional, and Pilot Area level)
- To create a set of multi-scale European water **scenarios** (starting from fast-track; focus on qualitative and semi-quantitative)
- To strengthen scenario use through direct experience (design **participatory** process; lead pan-European and guide Pilot Area efforts)



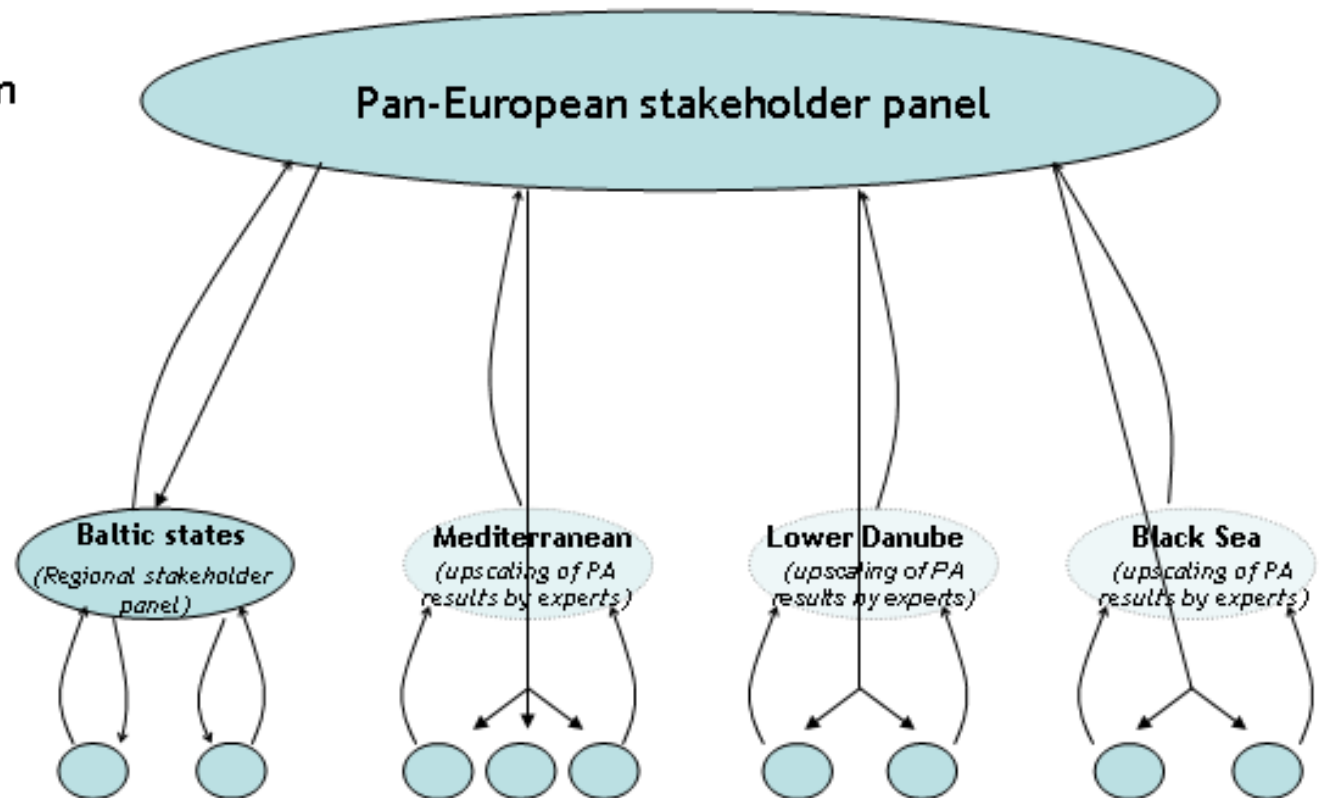


# Multi-scale design

Pan-European

Regional

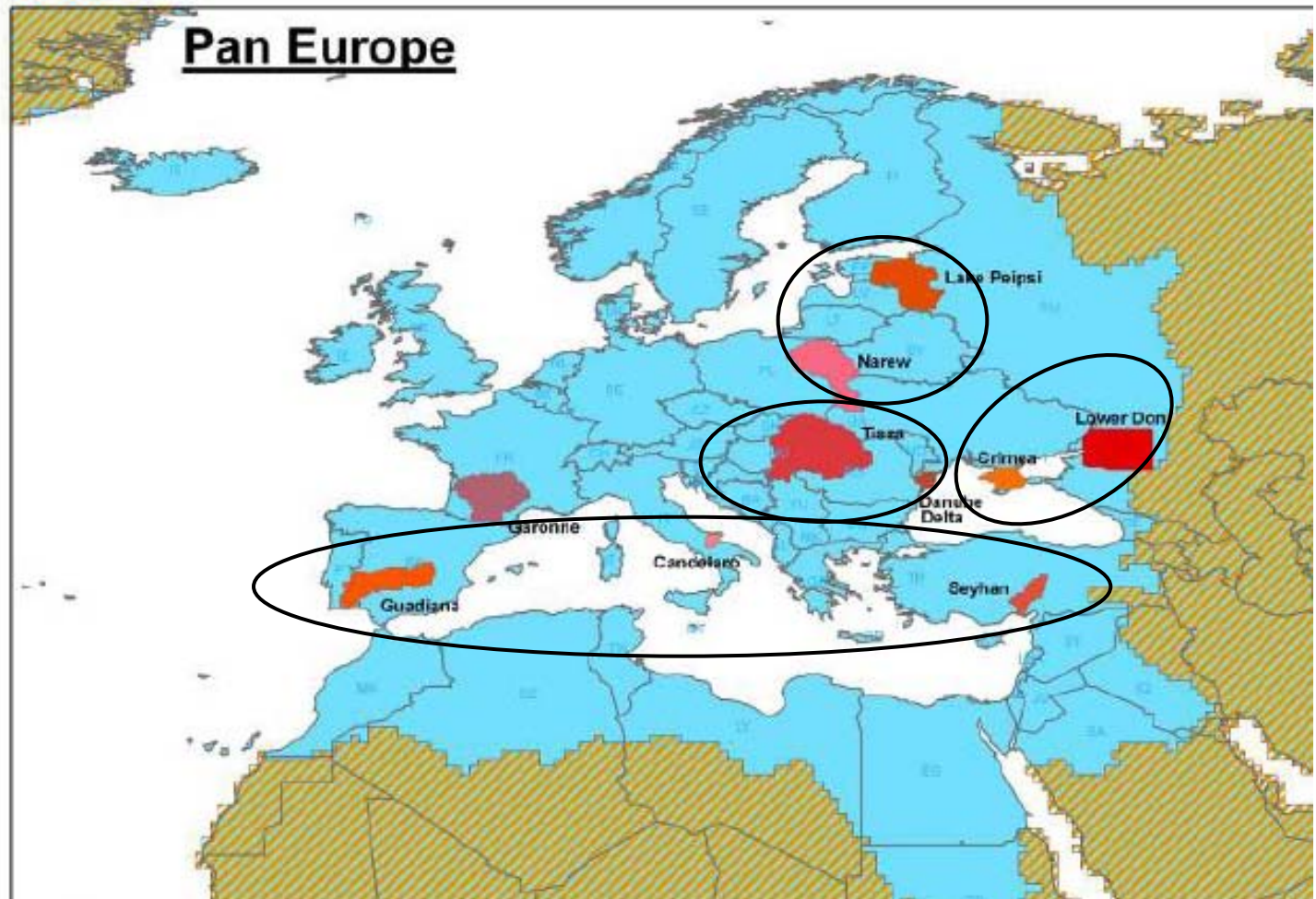
Pilot Area\*



\*Stakeholder panels and workshops in all Pilot Areas



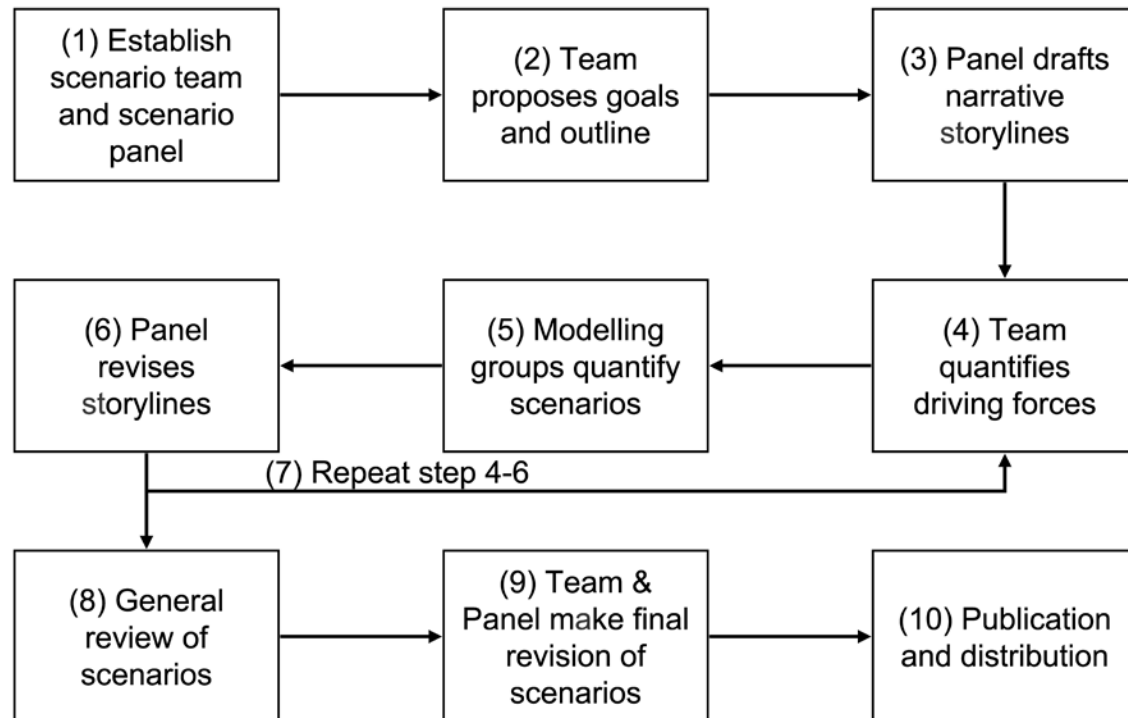
# Multi-scale design







# Basic methodology - concept: Story-And-Simulation





# Basic methodology

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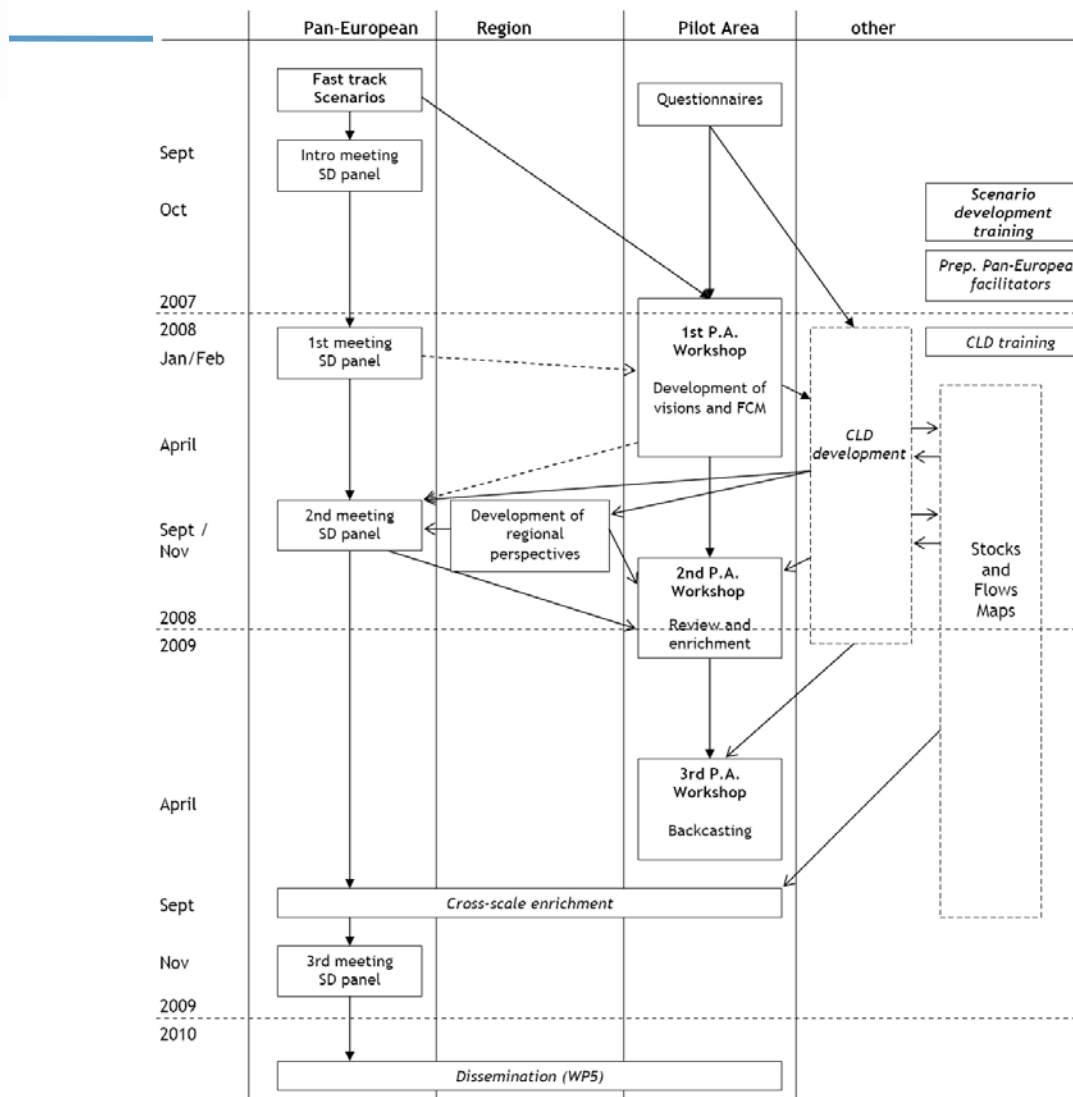
- **three** scenario development workshops
- following a **four-step** methodology:
  1. Describe **present** drivers and key factors
  2. Develop a set of **exploratory** (what if?) scenarios
  3. Develop a set of **normative** (what can we do about it?) scenarios
  4. Combine both types to uncover **robust strategies** (what should be done in any case?)





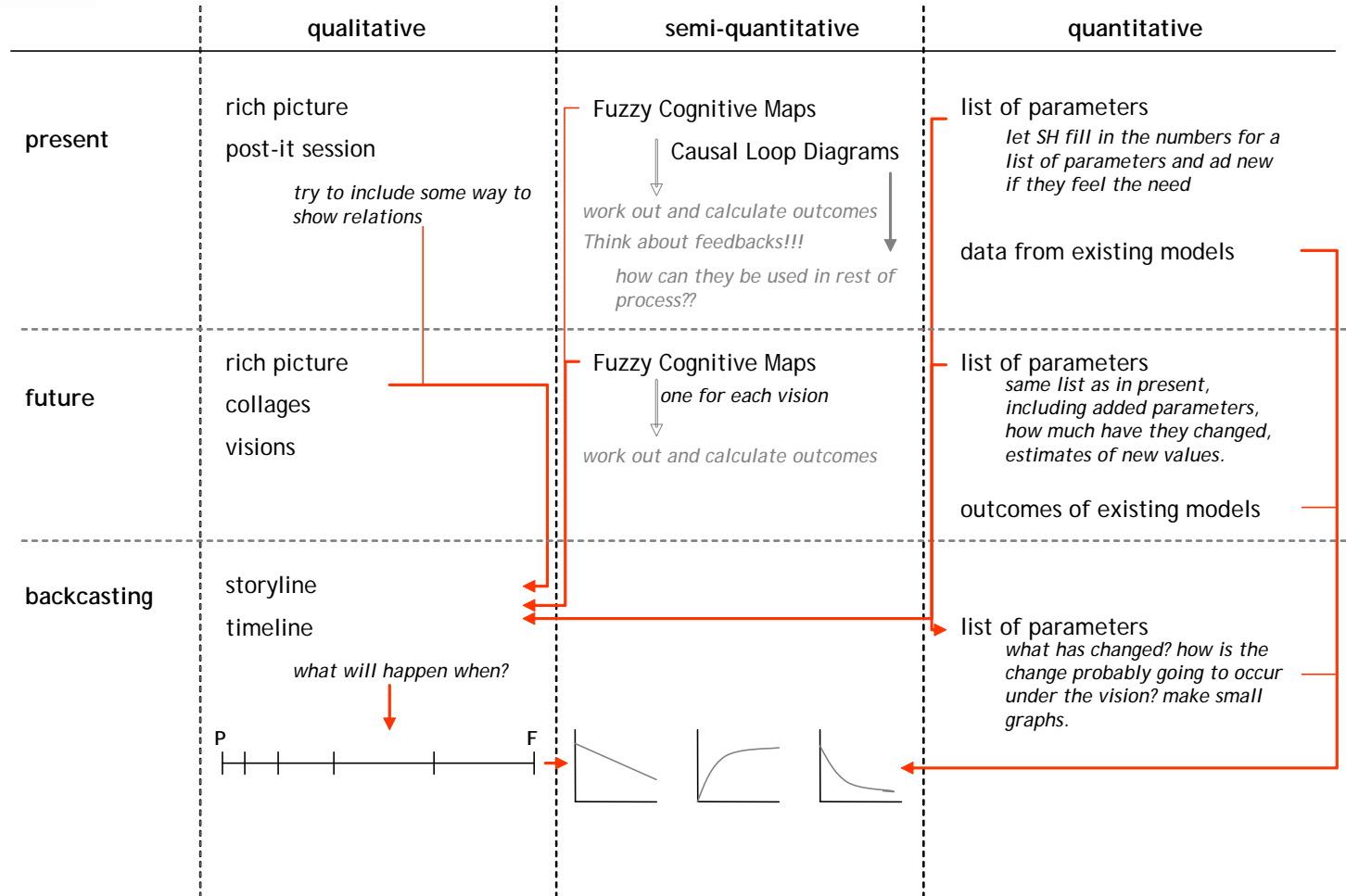


# Timing of workshops





# A toolbox of methods





# Pan-European scenario development

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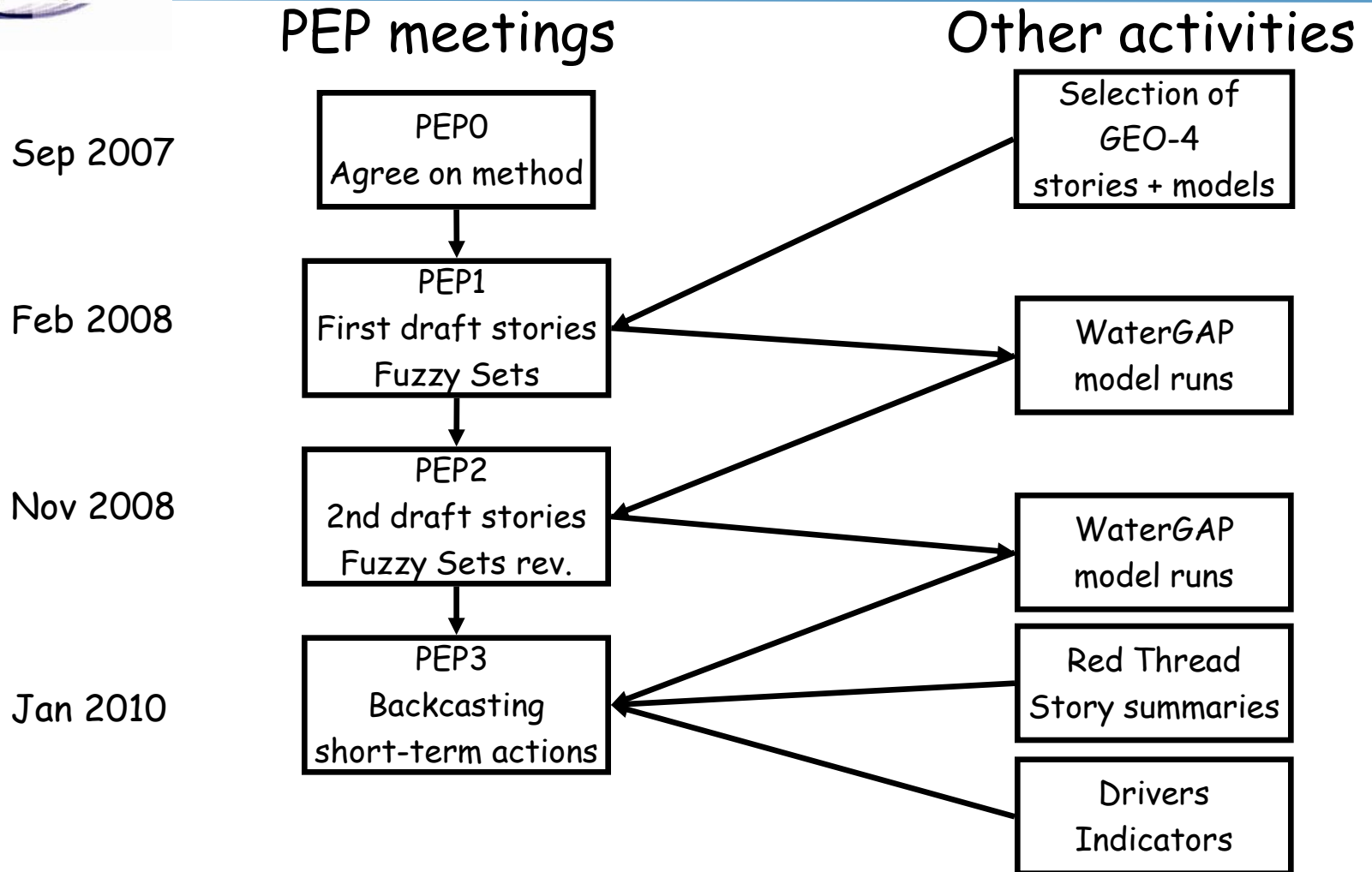
## *Main characteristics:*

- 4 workshops organised
- SAS approach followed closely
- Main results: 4 qualitative scenarios in the form of storylines; robust strategies



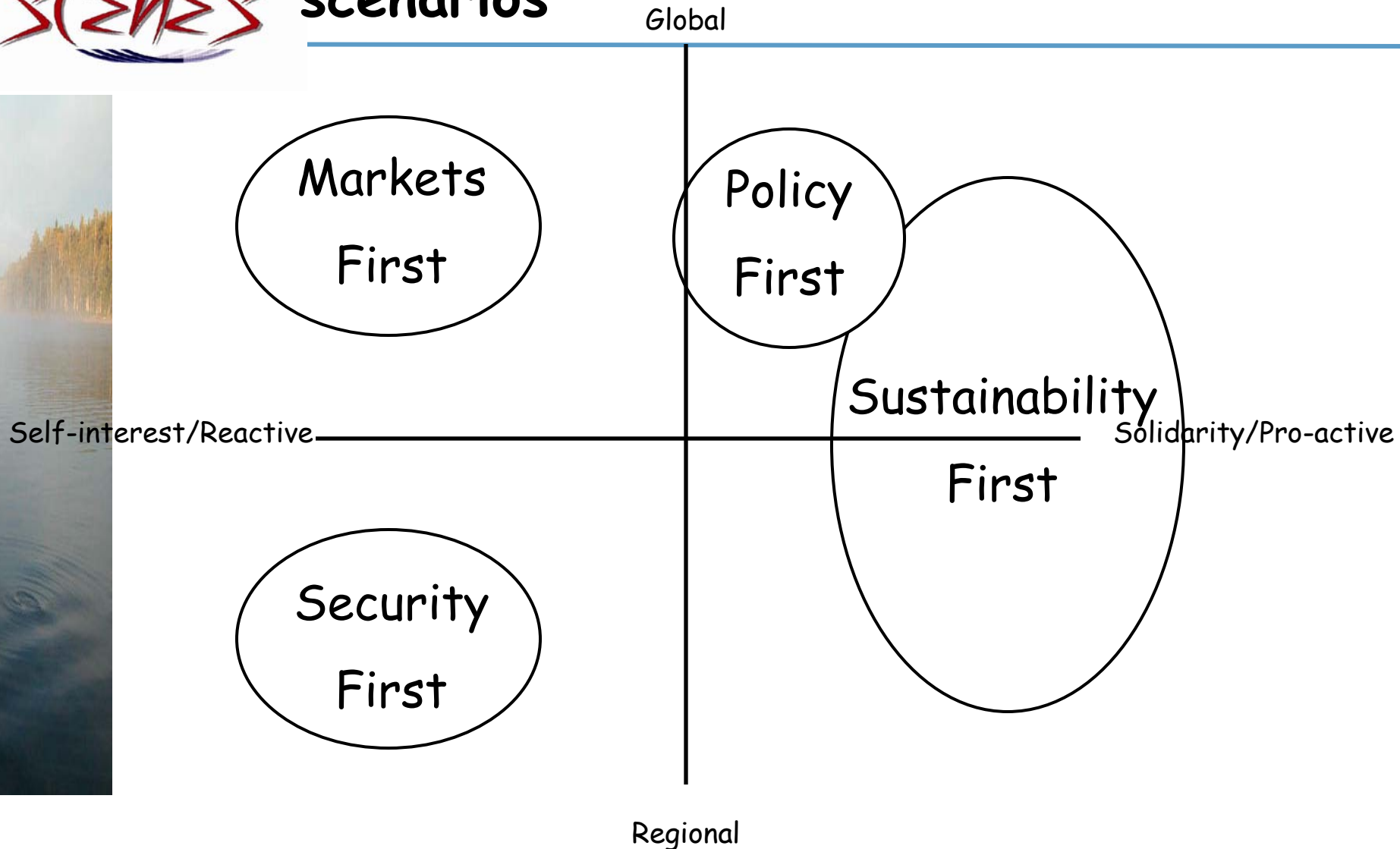


# Overview of all PEP meetings





# PEPO - using GEO-4 as fast-track scenarios





# PEP1 (Feb 2008, Delft)

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- Goal: Provide a first draft of a set of **storylines** until 2050
- Results:
  1. Water-related uncertainties
  2. Link of uncertainties to GEO-4 scenarios
  3. Zero-order draft stories







# PEP1 - impressions



END MARKET ASIF 2023 → 2050

No subsidies for agriculture  
 Population movement to urban areas with abandonment of rural areas  
 Manufacturing - increasing scandals of water pollution - re-intervention of government.  
 Electricity - Continuing trend from middle period (1. some new innovations)  
 Widespread privatisation of water supply + treatment.  
 Agriculture - Entrenchment of industrial agriculture in Europe.  
 Pockets of high pressure on water resources  
 Locally agriculture out-competes other sectors  
 Increasing inter-basin water transfer (now economically viable)  
 Mass. low-level treatment of ag wastes to make ecologically attractive products.  
 Domestic - Continuing increase in price of water.  
 Intensive local competition between domestic + agricultural sectors  
 Increasing economic incentives to improve water use efficiency + new water saving technologies.



WAGENINGEN

WAGENINGEN

WU

Kasper Kok



# Zero-order storylines



Scenario	Water demand	Water supply	Water availability	Water quality	Water technology	Water distribution	Water for food (irrigation)
Markets First	Green	Light Green	Orange	Red	Light Green	Orange	Green
Policy First	Orange	Light Green	Orange	Light Green	Green	Green	Light Green
Security First	Green	Red	Red	Orange	Red	Brown	Light Green
Sustainability First	Orange	Light Green	Light Green	Light Green	Light Green	Light Green	Orange



## PEP2 (Nov 2008, Helsinki)

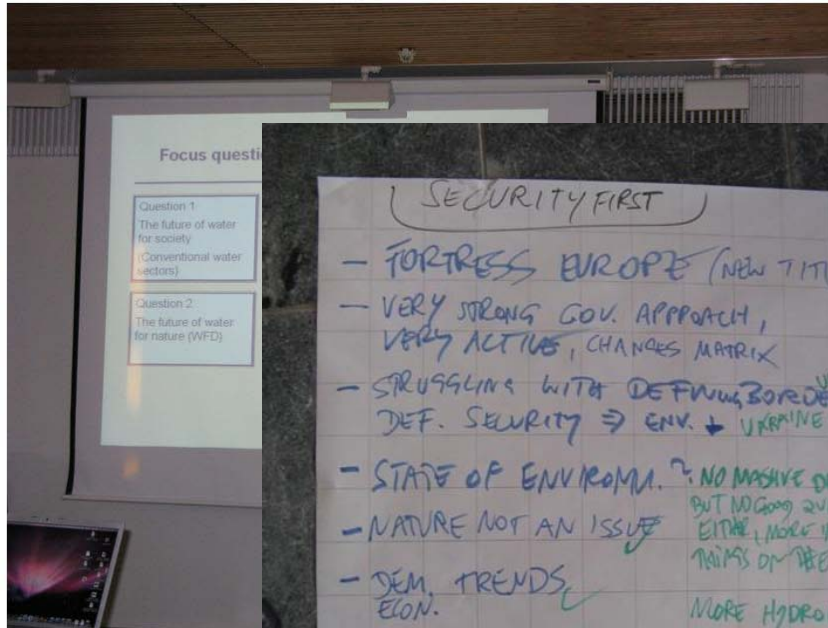
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- Goal & result: Provide a final draft of a set of storylines until 2050, including more water-relevant aspects





# PEP2 - impressions







# Storylines - final versions



Main factors	Economy First	Policy Rules	Fortress Europe	Sustainability Eventually
Globalisation	globalisation ↗	globalisation ↗	regionalisation ↘	regionalisation ↘
Attitude towards environmental management	reactive ↘	proactive ↗	reactive ↘	proactive ↗
Population dynamics (migration)	urban sprawl ↗	strong urbanisation ↗	migration only within EU →	strong migration ↗
Expansion of EU	expansion ↗	vastly expanded ↗	EU closed →	increase, later breakdown ↘
International cooperation	multinationals dominate ↗	strong ↗	within Europe ↗	eco-region based ↗
Water pricing	key instrument ↗	important ↗	important ↗	limited ↗
Economic growth	strong throughout ↗	somewhat lower ↘	slow after recession ↘	low ↘
Water policies (WFD)	limited success WFD ↘	all policies crucial importance ↗	changed focus to security →	WFD leading instrument ↗
Agricultural intensification (and role CAP)	intensification with weak CAP ↗	agriculture. strong CAP strong ↗	intensification with strong CAP ↗	less intensive with weak CAP ↘
Alternative energy sources	alternatives slowly introduced ↗	change to energy crops ↗	fossil fuels strong ↘	new generations of biofuels ↗
Water quality	generally declining ↘	first down, then up ↗	overall down ↘	first down, then up ↗
Water consumption	increase because of ec. growth ↗	increases to a certain level ↗	increases leading to conflicts ↗	strongly reduced ↘
Technology	high-tech growth ↗	focus on new energy technologies ↗	technologies outdated ↘	strong water saving technologies ↗
Environmental awareness	declines ↘	increases later ↗	not important, thus decline ↘	critical and strong increase ↗
State of the environment	declines ↘	improves in later phases ↗	declines ↘	improves ↗
Governance (bottom-up initiatives and role NGOs)	multinationals dictate ↘	top-down dominates ↘	cooperation is difficult ↘	bottom-up dominates ↗
Climate change impacts (droughts and floodings)	quick and rather strong ↗	first climate cooling ↘	moderate impacts later ↗	strong and immediate ↗



# PEP3 (Jan 2010, Paris)

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## Goal & results:

- Perform a backcasting analysis leading to a set of normative scenarios and strategies
- Link backcasting with the four explorative stories
- Draft a list of robust actions







# PEP3 impressions



# POLICY RULES

Strategy Element	FoE	SE	EconF
Regulatory System in lead	1	2	4
Pilot Exper.	2	1	2-3
2 CATEGORIES (Campaigns Educ/Res.)	2-3	1	3-4
Integration Top-Bottom	3-4	2-3	2-3

DIFFERENT  
FOCUS  
EFFECTIVELY

TRAINING OK

WORKS BUT  
DIFFERENT:  
PRODUCT  
ORIENTED  
MORE FOCUSED

EDUCATION FIVE

MULTIPLE  
LEVELS

## STRATEGY ADJUSTMENTS

Clarify  
Security  
Implications

Clarify Econ. Impact  
of Environmental  
Degradation

Add more Economic  
Instruments in  
our policy

SCALE: 1 GOOD FIT ↔ 4 BAD FIT



# PEP – Main results

- Four narrative storylines that can be considered water scenarios for pan-Europe until 2050. Names: *Sustainability Eventually, Policy Rules, Economy First, Fortress Europe*
- Four normative scenarios linked and connected strategies were developed. Examples: public-private partnerships; agricultural policy; awareness raising
- Fifteen robust elements were identified. Examples: spatial planning and flood protection; but also weak governance and financial constraints.





# PEP – Main conclusions

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## *Process:*

- Stakeholders were satisfied
- Workshops were successful
- Engaging stakeholders was slightly difficult

## *Results:*

- All main goals were met and all main products were delivered
- Cross-scale information was not included during PEP meetings





# Pilot Area scenario development

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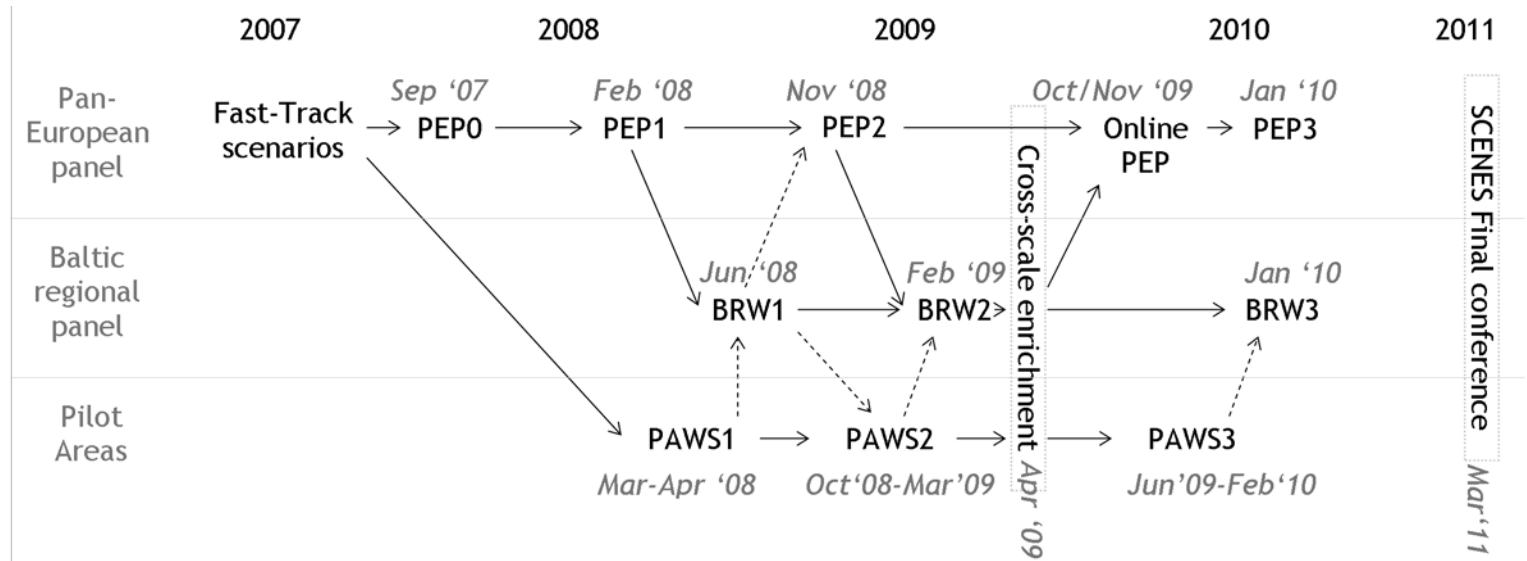
## *Main characteristics:*

- 3 workshops organised
- SAS approach not followed completely - lack of local models in all Pilot Areas
- Main method: **Fuzzy Cognitive Mapping**
- Workshops were organised in 9 Pilot Areas and for the Baltic region.
- Main results: FCMs, collages, storylines, backcasting





# PAWS - workshop timing





# PAWS - main methods and results

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PAWS1 - FCMs (present), storylines, collages

PAWS2 - FCMs (future), refined stories

PAWS3 - Backcasting and robust elements



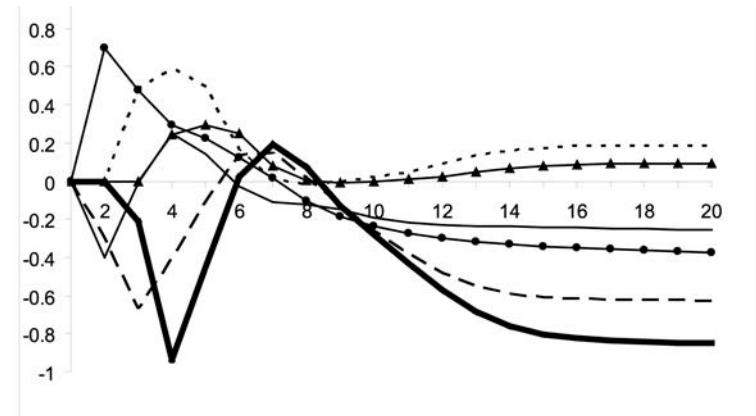
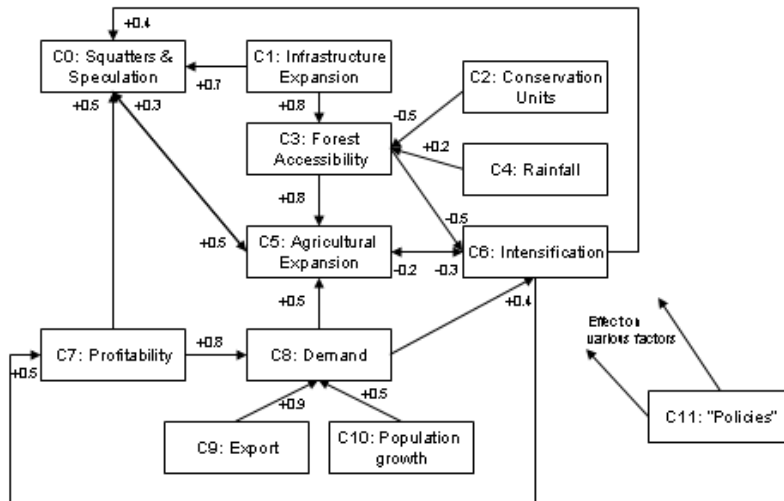




# PAWS - Fuzzy Cognitive Maps

Output of a Fuzzy Cognitive Map:

1. **System description:** Graph with 'boxes' and 'arrows'
2. **Temporal dynamics:** Chart with development over time





# Building participatory FCMs

Fuzzy Cognitive Maps can be developed within a one day stakeholder workshop following five steps.

1. Individually define factors that are important.





# Building participatory FCMs

2. Reach consensus on 10-15 most important groups of factors.





# Building participatory FCMs

## 3. Define most important connections between factors

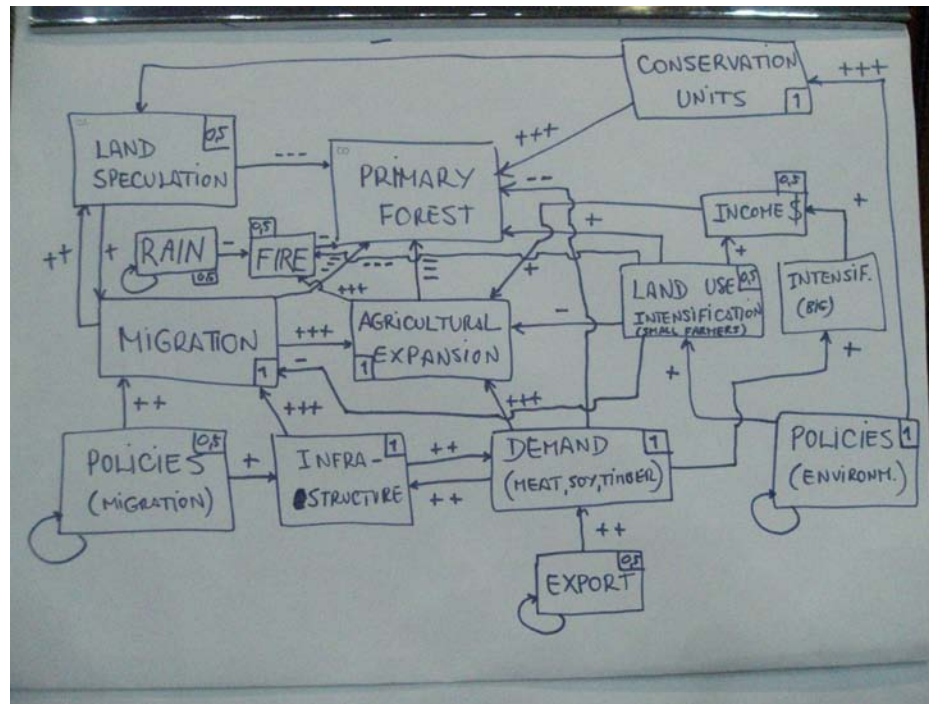






# Building participatory FCMs

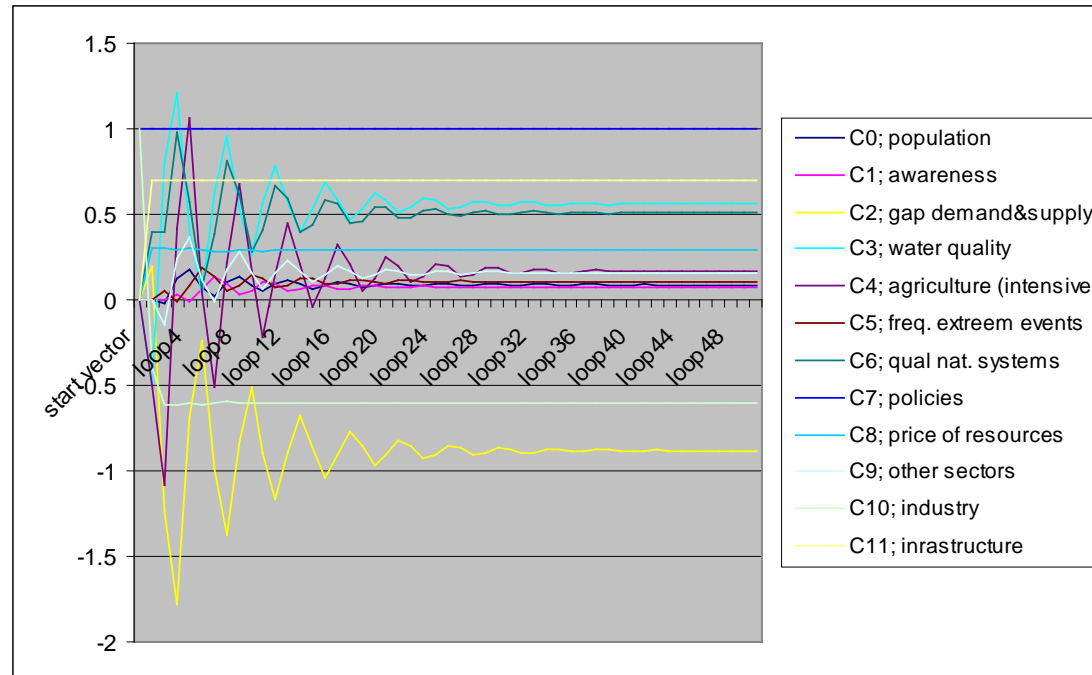
## 4. Define the strength of all relationships





# Building participatory FCMs

5. Use Excel spreadsheet to show dynamics over time and adjust Fuzzy Cognitive Map if needed



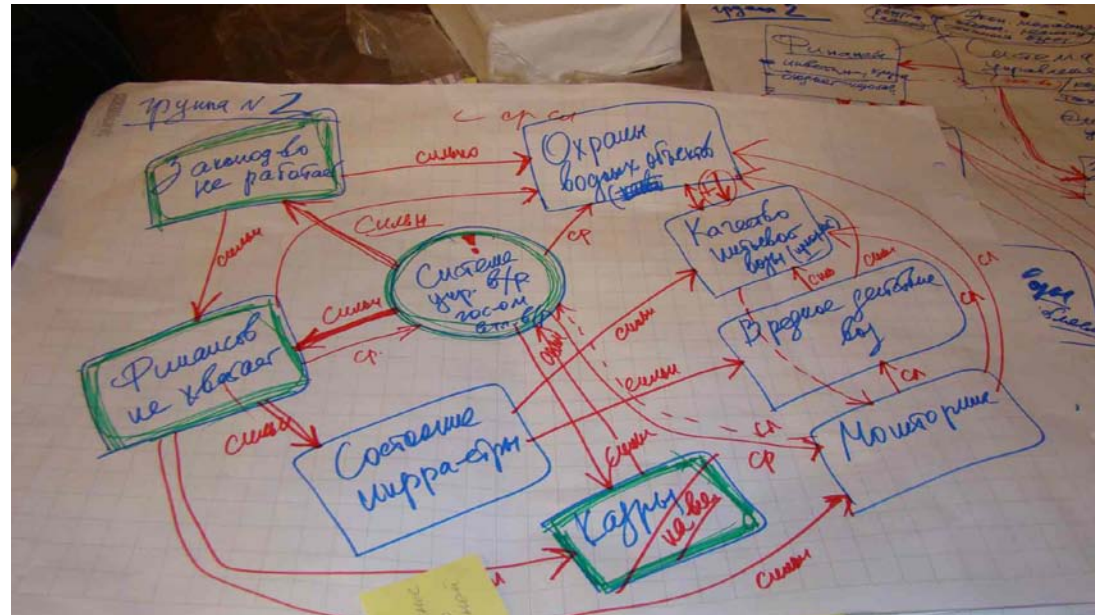




# Some examples - creative process



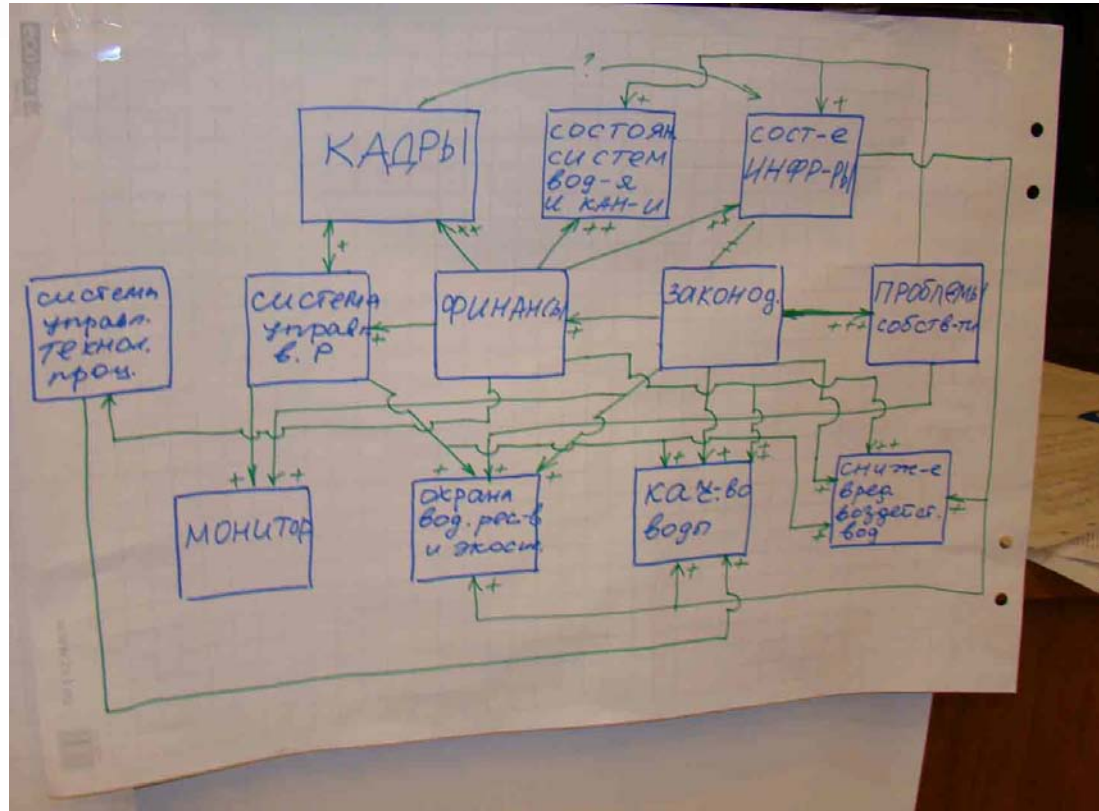
Guadiana - Spain



Crimea - Ukraine



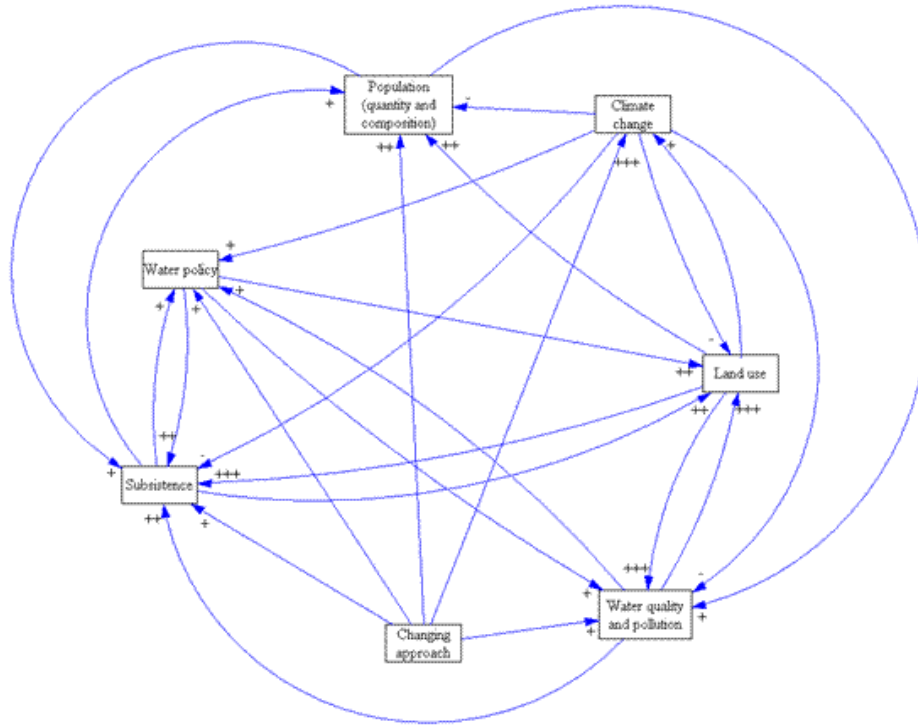
# Some examples - structured consensus



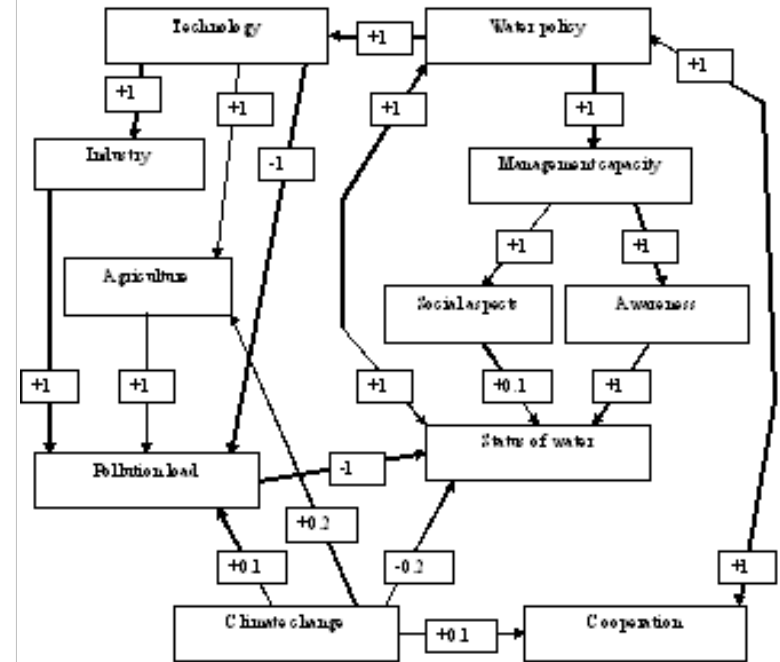
Crimea - Ukraine



# Some examples - using advanced software



Lower Tisza - Hungary



Lake Peipsi - Estonia



## PA – Main conclusions

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### *Process:*

- Stakeholders were satisfied across all Pilot Areas
- Almost all workshops were successful
- Developing FCMs was sometimes difficult (training local fac.)

### *Results:*

- All main goals were met and all main products were delivered
- PEP scenarios were used
- **Using FCMs increased comparability between Pilot Areas**





# Cross-scale enrichment options

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- Downscaling: Use of GEO-4 fast-track and PEP scenarios at Pilot Area workshops was successful
- Upscaling: Use of Pilot Area scenarios in PEP workshops largely failed
- Alternative upscaling: local partners enrich PEP scenarios during two SCENES meetings.







# Cross-scale enrichment in practice



*IA2 meeting in the Narew (2009) - Enrich storylines:*

- Separate paragraphs of region-specific text were added to PEP stories
- Current text was critically evaluated and changes were suggested

*IA2 meeting in Tallinn (2010) - Enrich backcasts:*

- Consensus was reached on main elements of a backcasting at regional scale
- PEP backcasts and robust strategies were enriched based on consensus view.



# Overall conclusions scenario development

- An innovative scenario development method was developed. Novel elements included:
  - Use of fast-track scenarios
  - Use of Fuzzy Cognitive Maps
  - Combining explorations and backcasting
  - Cross-scale interactions
- A set of (qualitative) scenarios was created:
  - Scenarios were developed at pan-European, regional, and local level
  - Products were highly comparable
  - Downscaling was performed successfully
  - Upscaling was partly successful
- The process was highly participatory with direct stakeholder involvement at all three scales







# Recommendations for future research

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- One goal per workshop! (e.g. either cross-scale OR backcasting)
- Expand the use of Fuzzy Cognitive Maps and/or flow diagrams
- Expand the use of other tools to facilitate quantification (e.g. Fuzzy Sets)
- Invest in the stakeholder selection procedure
- Plan workshops closer together (e.g. by working with LUT results or meta-models)





# Questions?

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