Introduction to adaptive management

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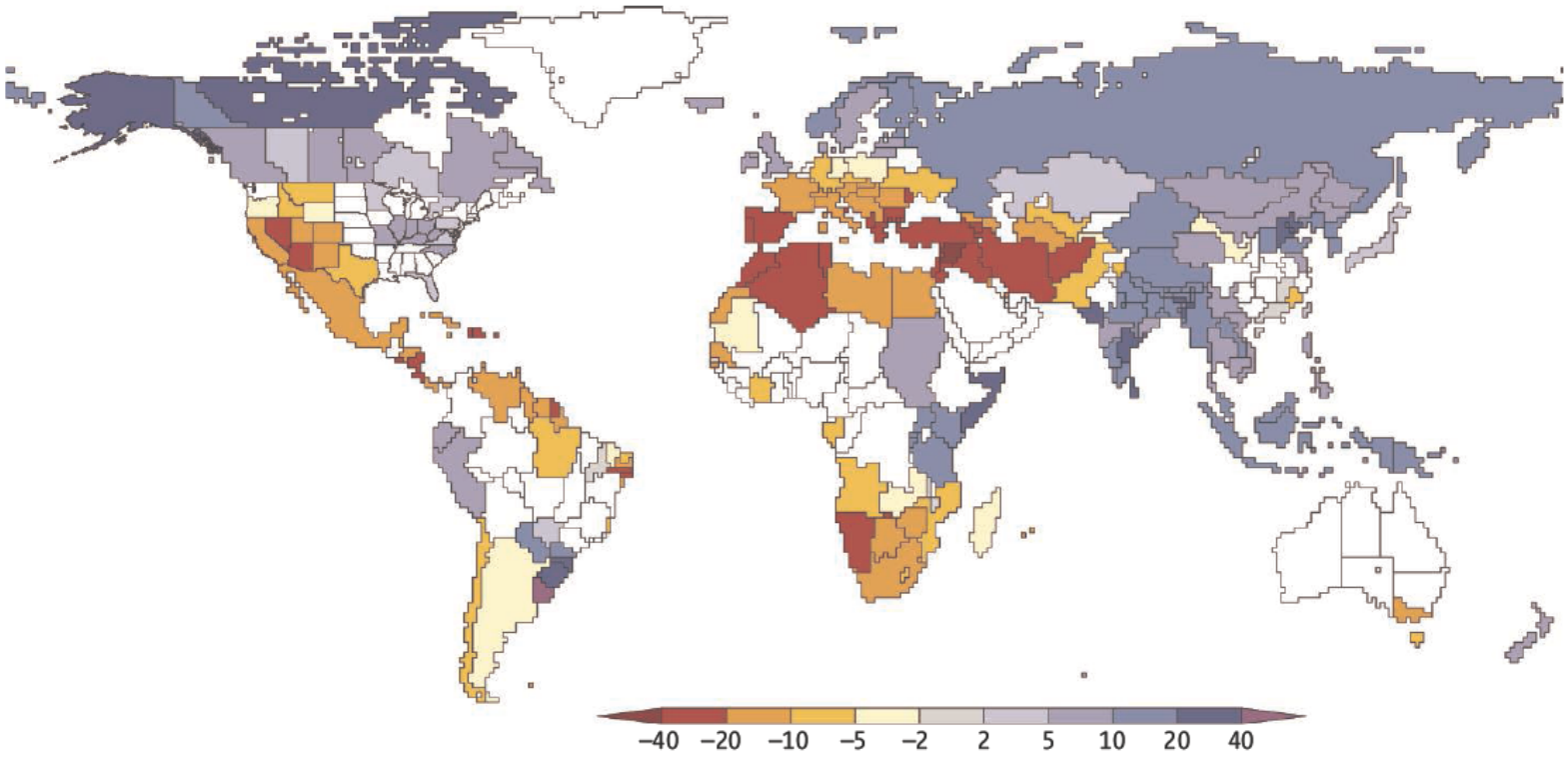
Outline

- **“Stationarity is dead”** (Milly et al., 2008)
- **Definitions and key features of adaptive management** (Huntjens et al. 2010; Henriksen and Barlebo, 2008)
- **Adaptive management and climate change responsiveness** (Huntjens et al. 2010)
- **Discussion**
  - What is the difference between adaptation and adaptive management?
  - When is adaptive management appropriate?
  - Lessons learned (Henriksen and Barlebo, 2008)
- **Summary**

”Stationarity is dead” (Milly et al. 2008)



Human influences. Dramatic changes in runoff volume from ice-free land are projected in many parts of the world by the middle of the 21st century (relative to historical conditions from the 1900 to 1970 period). Color denotes percentage change (median value from 12 climate models). Where a country or smaller political unit is colored, 8 or more of 12 models agreed on the direction (increase versus decrease) of runoff change under the Intergovernmental Panel on Climate Change's "SRES A1B" emissions scenario.

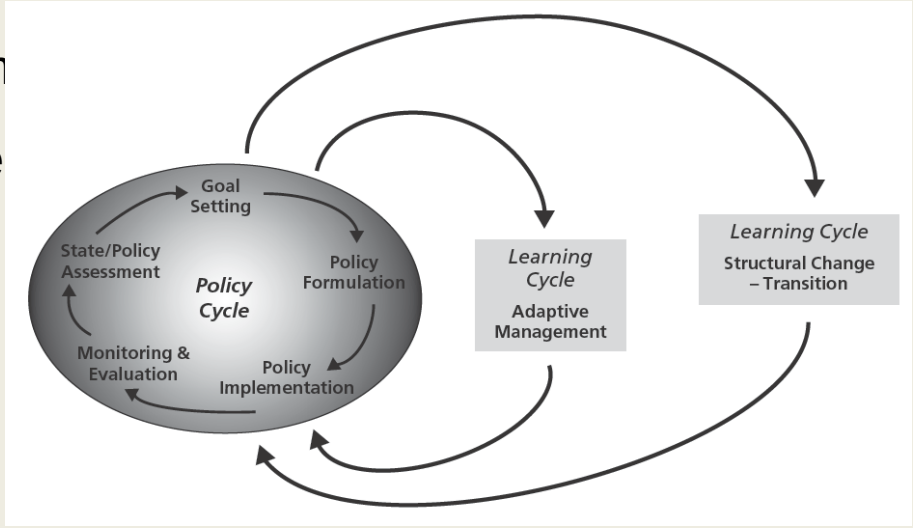
Key features and definitions of adaptive management

Definitions

Adaptive and integrated management can be defined as a structured process for improving systemic management policies and practices by learning from the outcomes of implemented management strategies (Pahl-Wostl et al., 2007; Huntjens et al., 2011)

Adaptive management is learning to manage by managing to learn (Bormann et al., 1993)

Adaptive management is a structured, iterative process of optimal decision making in the face of uncertainty, with an aim to reducing uncertainty over time via system monitoring ("learning by doing"



Source: Pahl-Wostl et al. (2009) in The adaptive water resources Management handbook

Ideal types of management regimes: prediction & control versus adaptive & integrated

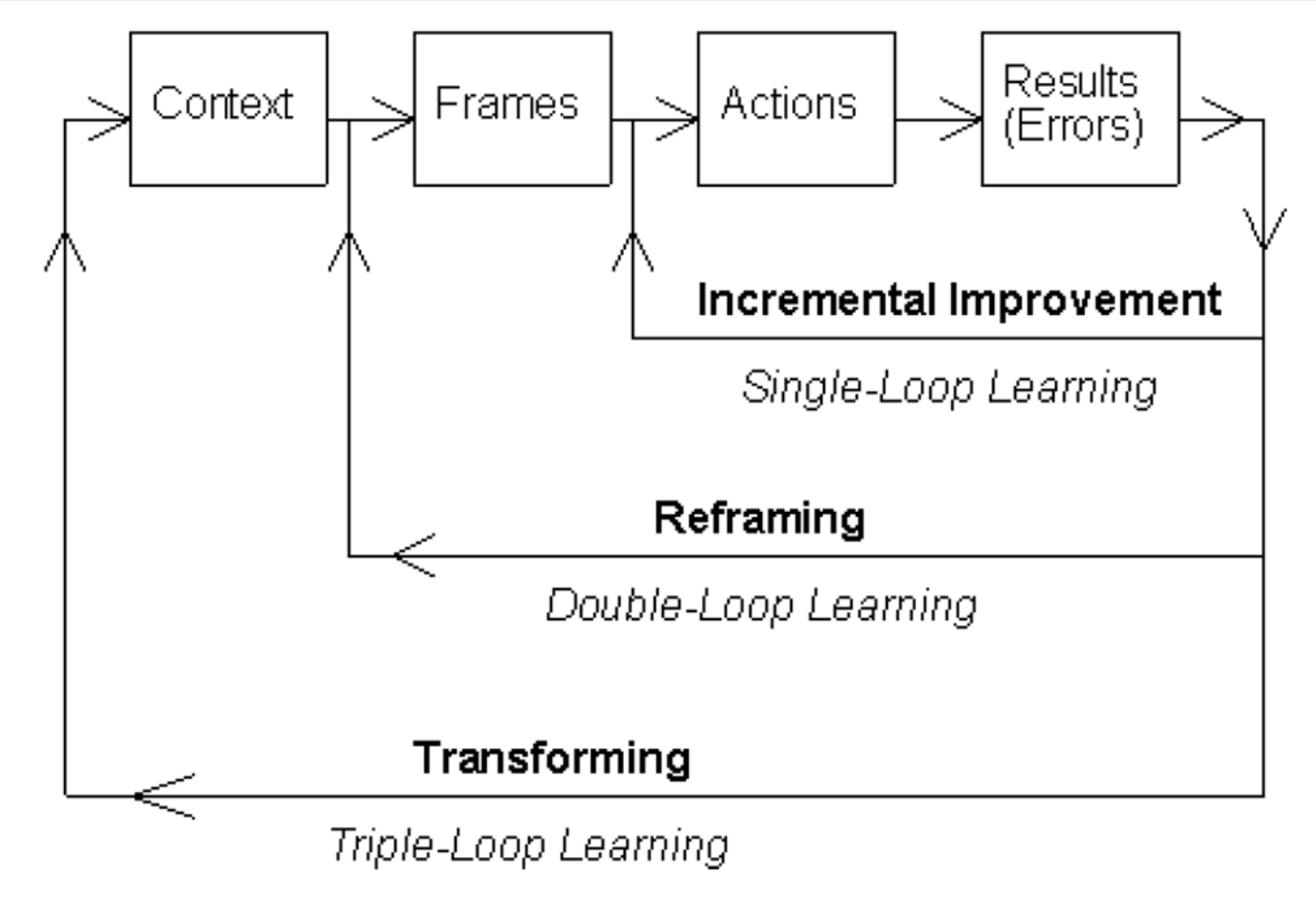
Table 1 – Ideal-typical characterizations of a prediction & control and an adaptive & integrated water management regime (modified from Pahl-Wostl, 2007b).

	Prediction & control regime	Adaptive & integrated regime
Management Paradigm	Control approach – goal oriented, optimal strategies Quantification of risk, reduction of uncertainties	Evolutionary approach – process oriented, robust strategies Risk dialogue, accept and live with uncertainties
Governance structure	Centralized, hierarchical, narrow stakeholder participation	Polycentric, horizontal, broad stakeholder participation
Sectoral integration	Sectors separately analyzed resulting in policy conflicts and chronic problems	Cross-sectoral analysis anticipates emergent problems, resolves conflicts and coordinates policy implementation
Scale of analysis and operation	Transboundary problems emerge when river sub-basins are the exclusive scale of analysis and management	Transboundary issues addressed by considering multiple scales of analysis and management
Information management	Understanding fragmented by gaps and lack of integration of information sources that are proprietary	Comprehensive understanding achieved by open, shared information sources that fill gaps and facilitate integration
Infrastructure	Massive, centralized infrastructure, single sources of design, power delivery	Appropriate scale, decentralized, diverse sources of design
Finances and risk	Financial resources concentrated in structural protection (sunk costs)	Financial resources diversified using a broad set of private and public financial instruments

Key features of adaptive management

- Change in governance regimes is conceptualized as social and societal learning. It addresses processes of purposeful action and of self-organization and emergence
- By re-evaluating goals, objectives and means how to achieve them as new information and insights become available, adaptive management is more responsive to changing conditions of and demands on ecosystems when compared to traditional approaches
- The distinction between social and societal is made to emphasize the importance of learning in multi-actor settings and of structural change in the governance regime as a whole. The ability to negotiate about and agree on rules and roles seems to play an essential role. Despite the collaborative nature of social learning strong leadership and facilitation have proven to be important
- Learning may have different degrees of intensity and scope from learning within groups, to actor networks and to structural change (addressed in the concept of tripple loop learning)

Tripple loop learning



Pahl-Wostl et al. 2010 Analysing complex water governance regimes: The management and transition framework ESP 13, 571-581

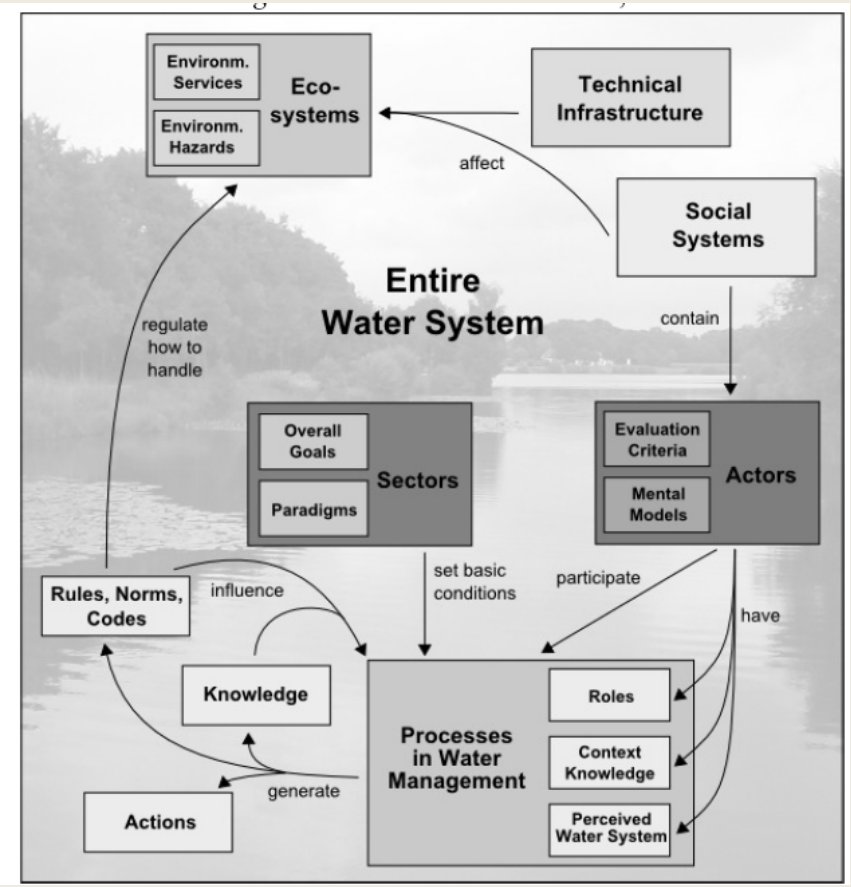
Steps in policy cycle

- In problem definition take into account different perspectives in participatory processes
- Scenario analysis in design of policies – strategies that perform well under different possible future developments
- Decision should be evaluated by the costs of reversing them
- Monitoring programmes should include different kinds of knowledge
- Institutional settings needed where actors assess the performance of management strategies and implement change in transparent fashion

Management regimes

- A management regime is here referred to as the whole complex of technologies, institutions (= formal and informal rules), environmental factors and paradigms that are highly interconnected and together form the base for the functioning of the management system targeted to fulfil a societal function.

- Due to the high interconnectedness and internal logic, individual elements of a regime cannot be exchanged arbitrarily



Example: water system (Mysiak et al 2009)

Responsiveness to climate change (Huntjens et al. 2010)

- To deal with existing and new complexities management must be able to respond to changes in the natural and social environment and to anticipate associated uncertainties
- Adaptation to climate change and management of related risks should be built into management plans and programmes
- Adaptive and integrated management is considered to be an appropriate approach for doing so
- Adaptive management requires different capabilities than traditional forms of management, particularly when it comes to creating forms of collaboration between managers and stakeholders, the relation between science and policy, the importance of participatory learning processes, dealing with uncertainty, and assessing a wide variety of possible measures and future scenario's

Social learning

- Folke et al. (2005): Social learning is needed to build up experience for coping with uncertainty and change
- Knowledge generation in itself is not sufficient for building adaptive capacity
- Learning how to sustain social-ecological systems in a world of continous change needs an institutional and social context within which to develop and act
- => important element of adaptive management is the governance structure (adaptive governance ~ synthesis of collaborative management and adaptive management)

Adaptive governance (Brunner et al.2005 Adaptive governance)

Scientific management

•Policy

- Goals are single targets to be realized efficiently; they are fixed, given, or assumed to separate science from nonscience, and progress is measurable
- Problem definition depends on scientific assessments within procedures and boundaries for solving problems and gaining support
- Science-based technologies are prerequisites for solving problems and gaining support
- Policy alternatives focus on how to realize the target, discounting uncertainties
- Planning is the priority in policy processes; monitoring and evaluating are not

•Decision making

- Management proceeds from the top down under a single, central authority
- Only the experts are qualified to make and implement sound management plans
- Bureaucracies are necessary to enforce uniform rules and regulations
- Expertise and authority to enforce rules and regulations are the necessary resources
- Plans and planning processes are standarized and stabilized over long periods of time
- Science replace politics through clear policy direction from elected officials

Adaptive governance

•Policy

- Multiple goals are to be integrated if possible or traded off if necessary; they depend on judgments in the particular context and are subject to change
- Problem definition depends on human interests and other contextual considerations, including law and policy
- Local and scientific knowledge are both relevant to solving policy problems
- Modest incremental steps minimize the unintended consequences of policies
- Policy process often depends on monitoring, evaluating, and terminating failed policies

•Decision making

- Policy integration proceeds from the bottom up under fragmented authority and control
- Participation is open to almost any person or group with a significant interest in the issue
- Community-based initiatives can compensate for the limitations of bureaucracies
- Local knowledge, respect, and trust are a few of many resources necessary for succes
- Successful policies are diffused and adapted elsewhere, at the same and higher levels
- Politics are unavoidable and are commendable when they advance the common interest

Comparative analysis of four river basins (Huntjens et al., 2010)

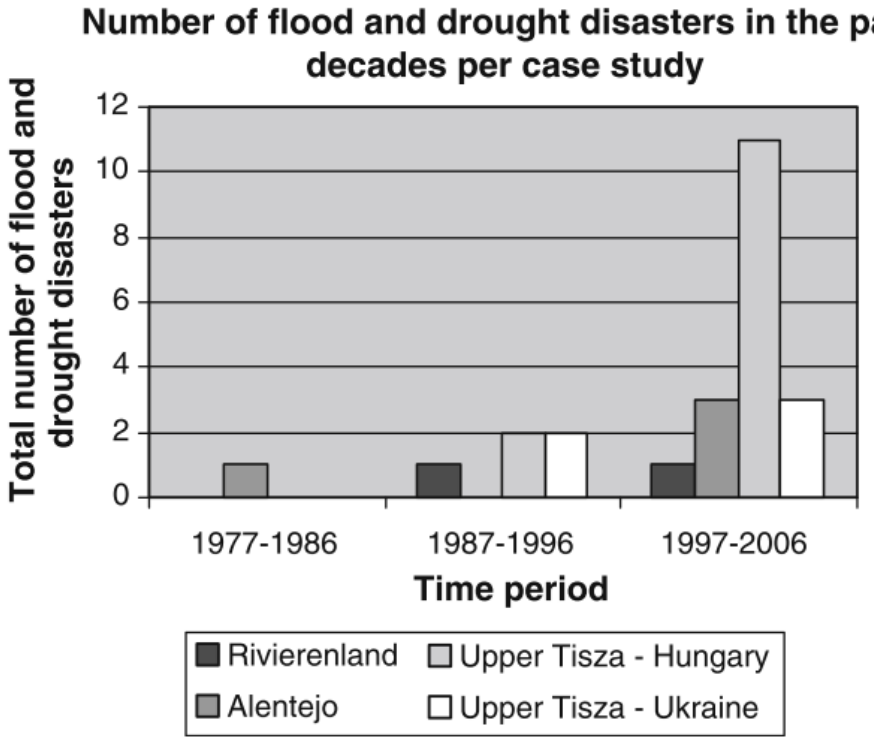


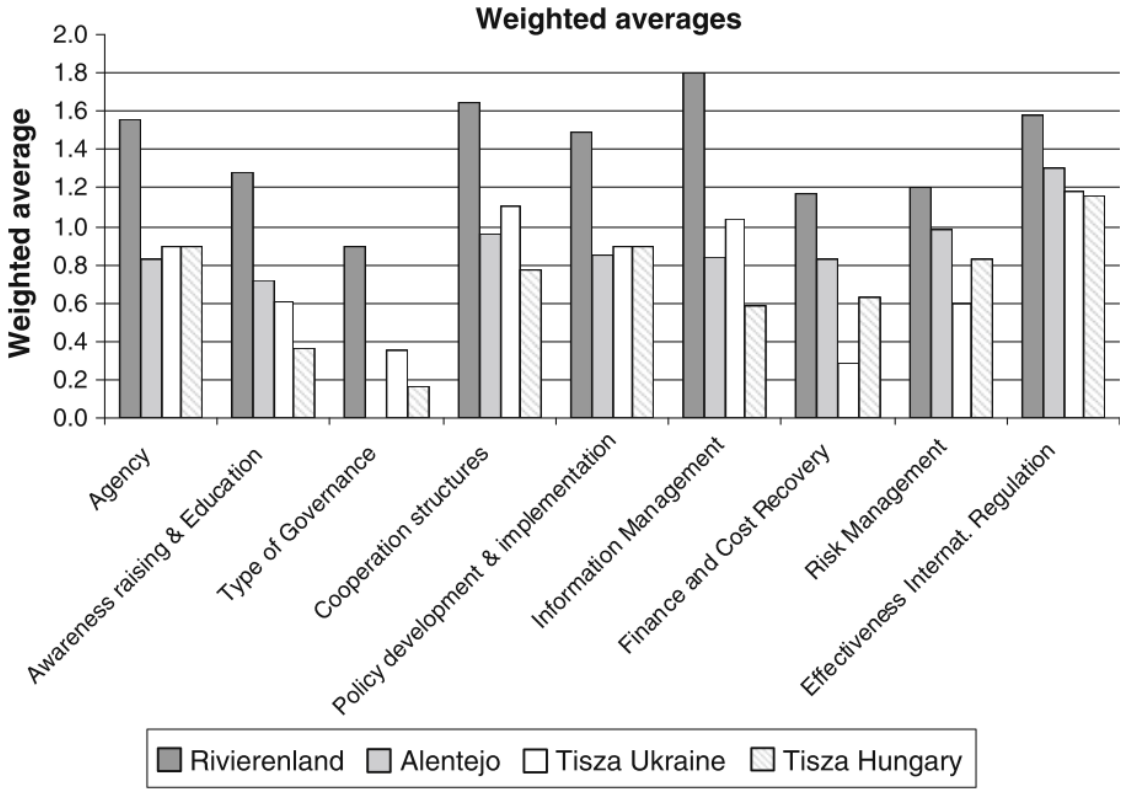
Fig. 1 Number of reported flood and drought disasters in the past decades in Rivierenland, Alentejo, Hungarian part of Upper Tisza, and Ukrainian part of Upper Tisza. Based on data from EM-DAT:

Normative framework for assessing the Characteristics of a water Management regime

1. Agency
2. Awareness Raising & Education
3. Type of governance
4. Cooperation structures
5. Policy development & implementation
6. Information management & sharing
7. Finances and cost recovery
8. Risk management
9. Effectiveness of (international) regulation

Comparative analysis of characteristics of AIWM (Huntjens et al., 2010)

Fig. 3 Level of Adaptive and Integrated Water Management in coping with climate-related extreme events in the four case-studies (0 = non-adaptive and non-integrated, 2 = adaptive and integrated). From: Huntjens et al. (2007)



- Rieverineland (NL) appears to be the closest to AIWM, with dimensions interdependencies (most profound between information management, cooperation structures, and conflict resolution)

Responsivenes to droughts and floods (Huntjens et al., 2010)

- Responsiveness to droughts is considered lower than responsiveness to floods
  - Flood problems are more directly perceived by not only experts and policy makers but also by wider public creating a policy window through public pressure
  - If one issue dominates, the other is ignored
  - Critical awareness treshold is directly related to joint/participative information production
  - In contrast to poor responses to drought and low flow problems, a higher level of AIWM seems to result in more adequate responses to flood problems, at least in terms of flood protection or mitigation measures
  - AIWM enables more diversity in response measures => moving up in learning level (single -> double -> tripple)

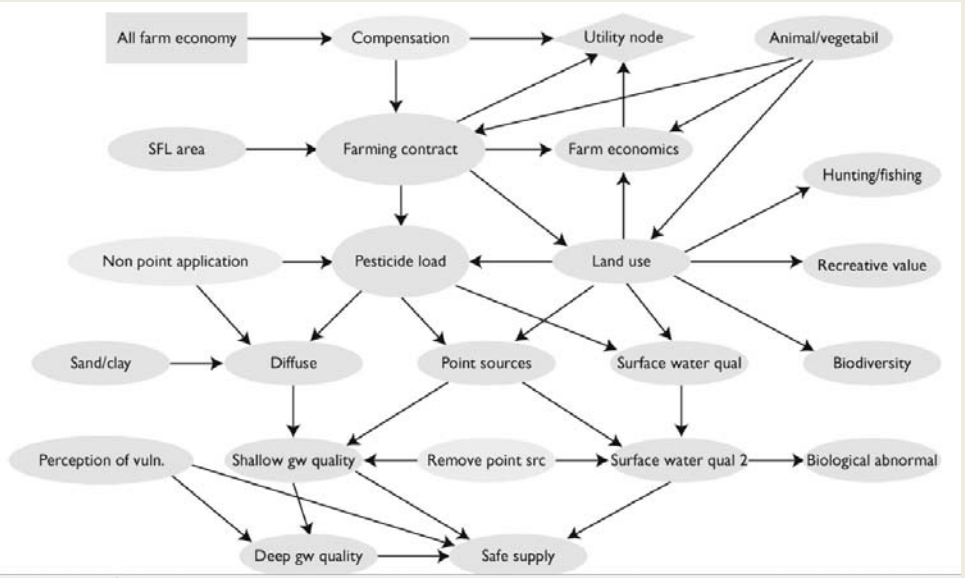
Discussion (1) – what are the difference between adaptive management and adaptation?

- Adaptation refers to both the process of adapting and to the condition of being adapted. The term has specific interpretations in particular disciplines
- The IPCC (2007) defines climate adaptation as, ”adjustment in natural or human systems in response to actual or expected climatic stimuli or other effects, which moderates harm or exploits beneficial opportunities
- Examples of climate change adaptation are:
  - Coastal dikes and water gates which hold back rising sea levels,
  - Introduction of drought resistant crop varieties, and
  - Efforts to boost the resilience of ecosystems and communities from extreme meteorological events

Discussion (2) When is adaptive management appropriate?

- Adaptive management is especially appropriate when uncertainties make management choices difficult, but the prospects for reducing uncertainty appear good
- Adaptive management is not a panacea
  - It requires more resources than conventional management, due to time for careful system analysis, monitoring of results, and periodical reassessment and revision
  - It imposes unfamiliar demands on management institutions for long-term committment of human and financial resources
  - It imposes greater demands on stakeholders, because they must monitor decisions and the decision-making process over the time of the life of the project
  - Because decisions are always tentative, it may also increase or extend controversy and conflict
  - It may require trading the anticipated best outcome in the short term for long-term learning and improvement

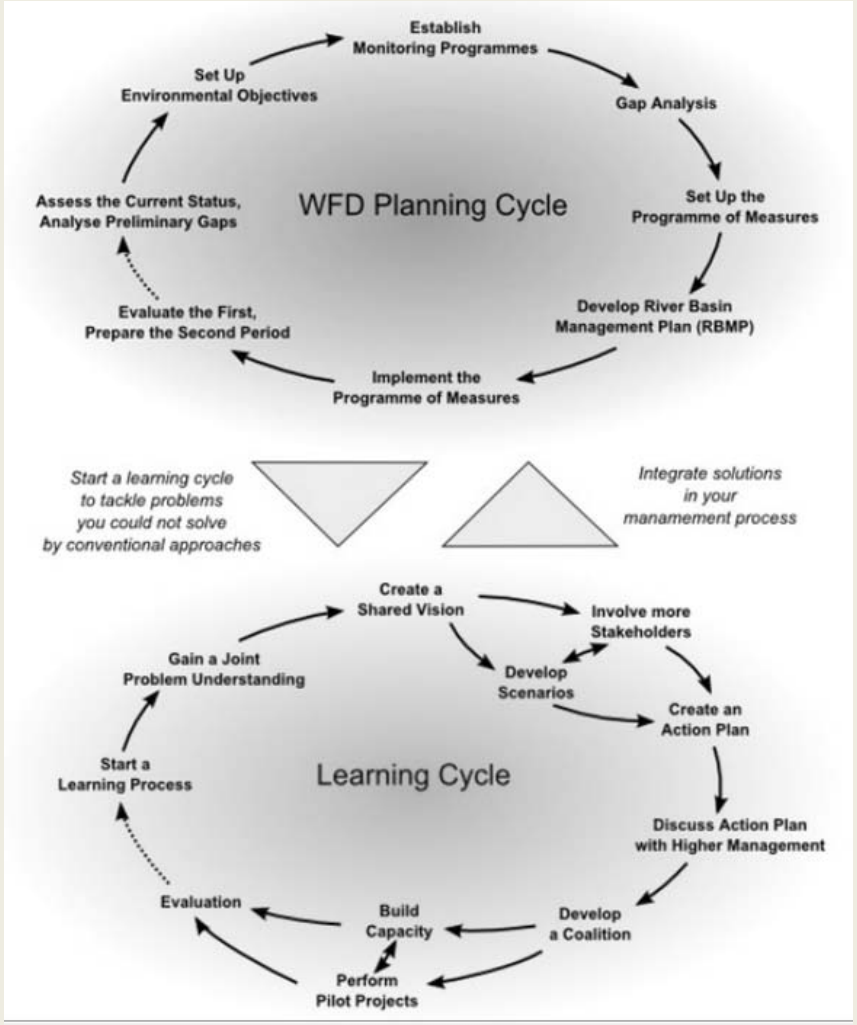
Discussion (3) Lessons learned (Henriksen and Barlebo 2008)



- Complexity is usually approached by selection of scenarios
- We have always been adaptive, the challenge is to integrate things (familiar with adaptation, adaptive management is a challenge)
- A problem is to assess water cost efficiency and value for money combined with other non-monetary values and how to learn to specify this in partnerships with stakeholders and economists (groundwater protection is dealing with a hypothetical market)
- Water managers needs tools for evaluating how efficient resources are used in the environmental management (e.g. Bayesian networks could be used for that, because this tool can help reasoning about complex and uncertain systems, if used interactively and as a participatory tool)
- There has to be plenty of time and room for reflection

Summary (1) – Learning cycles

- Adaptive management is a structured, iterative process of optimal decision making in the face of uncertainty, with an aim to reducing uncertainty over time via system monitoring ("learning by doing")
- Adaptive management focus on social learning, deals with conflicting interests with full stakeholder involvement and use scenario planning in search for robust actions ("tripple loop learning cycles"
- Focus on adaptive capacity, resilience and vulnerability in relation to climate change



Summary (2) Lessons learned

Build capacity	Commit to uncertainty	Think twice before deciding	Dare experiments	Plan for adaption
 Based leadership	 System analysis	 Toolbox	 Level of focus in pilots	 Supported leadership en route
Effective leadership and sustained financial support are crucial. Horizontal and vertical coordination and harmonization are essential to facilitate change.	Integrated and forward-looking approaches need to take into account new realities and challenges. Short and long term scenario analysis can inform policy and specify learning goals. Commitment to uncertainty results in robust policies.	Diverse tools are needed to explore vulnerability and resilience, encourage systemic learning and create opportunities for adaptive water management.	Experiments can be put in place at different institutional levels. Successful small-scale pilot studies can help to instigate new management approaches. Integrated performance and compliance assessment require apposite monitoring.	Stakeholder engagement, education and the creation of bottom-up user associations are crucial steps to attaining adaptive surface and groundwater management.
Lighthouse	Explorer	Apparatus	Researcher	Nurture
L	E	A	R	N

Figure 12.2 *Metaphors and lessons learning from piloting AWM in NeWater case studies*