NONAM

Nordic Network on Adaptive Management in relation to climate change

Risk Assessment and Stakeholder Involvement

Multidisciplinary Workshop in Reykjavík

26 - 27 August 2010

Final report

Contents

Introduction

NONAM stands for NOrdic Network on Adaptive Management in relation to climate change. The NONAM network is one of the 10 networks funded by the Nordic Council of Ministers as part of the Top Research Initiative (TFI) networks programme on Effect Studies and Adaptation to Climate Change.[1] Regular updates on NONAM can be found at the website http://en.vedur.is/nonam.

The idea behind the network is that it aims at the strengthening of the Nordic research capacity and at orienting (also) at societal research needs, notably with respect to the preparation and implementation of adaptation policies in public and private organization.

The prime theme area of NONAM is: *risk management and decision support with respect to adaptation policy development and related investments, notably regarding infrastructures of various kinds* (energy, transport, water & sanitation, communication) and the *overarching planning and management systems* that create the context in which these systems are designed and operated (urban and coastal zone management e.g. planning and disaster prevention & relief and rescue)

NONAM intends to enhance the following by means of its networking facilities:

- the methodological development regarding adaptation assessment with special reference to (common) needs in Nordic countries
- the actual application and testing of these methods in co-operation with sector stakeholders in Nordic countries, while using regionalized climate change projections and natural impact assessments
- comparability and useful standardization of methods with the aim to speed up uptake of these applications and learning from these applications across the Nordic countries and in order to develop a Nordic framework for adaptive management
- the development of academic and professional education in Nordic countries needed to support the development and use of these methodologies

Three main events will be organised. In 2010 a kick-off workshop in Reykjavik is organised with the purpose to map the field. The present synthesis report is based on that workshop. In 2011 a PhD school is planned in Copenhagen from 22 to 26 August. A large concluding conference is planned for 2012 (June or August) in co-operation with the fellow network NORDCLAD and possibly other networks as well.

The next pages contain a summary of the entire workshop and synthesis reports of the parallel break-out sessions on adaptive management approaches for climate change adaptation planning in the water sector and the road infrastructure sector respectively.

[1] http://www.toppforskningsinitiativet.org/en/programmer-1/program-1.

Summary

By Jens Christian Refsgaard (GEUS)

On August 26–27, 2010 the Nordic network NONAM[2] arranged a "Multidisciplinary Workshop on Risk Assessment and Stakeholder Involvement" in Reykjavik. The aim of the workshop was to strengthen links and exchange information among Nordic researchers and practitioners in adaptive management related to adaptation to climate change. The workshop focused on three topics: (i) What is the difference between adaptation and adaptive management; (ii) Participatory planning processes – group model building; and (iii) Uncertainty and risk assessment.

The workshop was organised by the NONAM core members: The Finnish Meteorological Institute (FMI), The Geological Survey of Denmark and Greenland (GEUS), and The Icelandic Meteorological Office (IMO) with IMO taking care of all logistics related to the workshop activities in Reykjavik. The workshop was attended by 45 scientists and practitioners.

The programme comprised a combination of oral presentations, posters, work on case studies in break out groups, and plenary discussions. The 11 presentations that were given by scientists and practitioners from all five Nordic countries covered theoretical aspects as well as case studies. Abstracts and slides from the oral presentations are available at http://en.vedur.is/nonam/workshop/. The two break-out groups worked on two different cases: (a) The Horsens Fjord case focussing on water resources (including the institutional and technical infrastructure needed to manage the water quality and quantity); and (b) National road infrastructure planning and maintenance in Nordic countries, with special reference to Finland. Summary reports from the two break-out groups are included in the present report.

The concluding plenary session highlighted the similarities and the differences between the two cases, i.e. between the water and the road infrastructure sectors. The commonalities were apparent, as the same or largely the same methodologies were in many instances recommended from the two groups. However, the recommended approaches in climate change adaptations and adaptive management showed some interesting differences, which to a large extent may be explained as a result of differences between the two sectors such as:

- *Decentralised/centralised*. The water sector is relative decentralised with a tradition for "management at the lowest appropriate level" and the management responsibility in the present case anchored at the municipality level. The road sector studied in the present case focussing on the national infrastructure also includes multi-stakeholder processes in planning and maintenance; however, as it is characterised by a relatively more centralised (top-down) type of management.

[2] NONAM stands for: Nordic Network for Adaptive Management in Climate Change Adaptation Planning. It is funded by the Top Research Initiative of the Nordic Council of Ministers.

- *Conflict resolution mechanisms*. The water sector is characterised by many strong stakeholders, who have to compromise to allow a water management solution to be achieved, and often the stakeholders are directly involved in negotiating the management solutions. The national road sector decisions are more often made at the central government level, i.e. by one dominating stakeholder, even though especially during the planning phase various stakeholders can have very significant influence on choices made.
- *Sectoral/multisectoral*. The road sector is under one ministry, which is a strong player and decision maker, and this ministry is the "service provider" (even though the rising popularity of public service contracts starts to blur this picture). The water sector, on the other hand is to a much larger extent dependent on several ministries and local governments (municipalities, regions) and no agency functions as "service provider" with a clear mandate to take decisions that overrule the other players.
- *Infrastructure/natural resource*. Roads constitute a typical infrastructure, which facilitates services (transport), while water primarily has a (natural) resource character.
- *Different histories on adaptive management*. The water sector has more experience with adaptation and adaptive management, both from research projects and in practise. National road authorities have started more recently with development of adaptation plans.

Altogether, the workshop was very successful in bringing Nordic researchers and practitioners together. As illustrated by the two different case studies all participants were confronted with views and experiences that were different from their own. This cross-fertilization between the different disciplines was emphasised, in the feedback from the workshop participants, as extremely interesting and valuable. We intend to elaborate further on the topics brought forward during the workshop in the coming NONAM activities, in the first place the PhD Summer School 22–26 August 2011 in Copenhagen (see http://en.vedur.is/nonam).

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Summary of the break-out sessions on road infrastructure

By Adriaan Perrels (FMI)

1. Introduction

The break-out sessions, three in total, were interspersed between the various oral presentations on Thursday afternoon, Friday morning and Friday afternoon. Each session was 60 to 80 minutes. The participants had two assignments:

1. deliberate 7 questions on issues pertaining subsequent stages of adaptation policy development (in an adaptive management setting) – the questions are listed below in the textbox and in Annex 1.;
2. to produce a flowchart of an adaptation plan (outline) based on the ideas of adaptive management (as synthesized in the 'double loop model') – see figure 1.

The first session started with an introduction to the sector / case considered, followed by a brief general discussion on the outlined features of the sector. The rest of that session was used to deliberate on questions 1 to 3 (or 4). In the second break-out session the rest of the questions were handled, whereas the third session focused purely on the generation of a flowchart. After the first and third session a plenary session was held in which a summary of findings of each parallel session was presented by rapporteurs and discussed in the audience.

2. An outline of the challenges of adaptation planning for the transport sector

What should we count in?

Roads and transport systems are vulnerable to climate change impacts. Furthermore, the future road system will have to provide an adequate service level while accounting also for other long term changes, such as in demography (ageing), in economic structure (possibly reinforced by mitigation policy), and in spatial organization (contrasts between regions, urban sprawl).

The road system is a part of the overall transport system and e.g. for several goods transport categories other modes such as rail and inland/coastal waterway are relevant alternatives. So, as it comes to scenario analysis the road system cannot be assessed in isolation from other transport networks with which it is both competing and co-operating[3]. Yet, it seems that for strategic level adaptation planning the national level road system can be regarded largely as a separate entity, distinct from other modes. Similarly, at regional/local levels mainly links to the neighboring regions count, not so much links to other networks. This delineation is also important in order to keep the adaptation planning and policy cycle manageable, because the road transport sector has many stakeholders with different agendas. Climate change has a large

[3] Virtually all other modes can serve for replacing the main transfer, yet, in most cases pre- and posterior transport by road remains necessary.

variety of direct and indirect impacts on the transport sector. It is a challenge to set up design processes where uncertain and increasing information on climate change will be used in decision-making and planning. Table 1 below shows a tentative distribution of activities by different stakeholders and by geographic / administrative aggregation level.

Table 1 – *Tentative identification of relevant (predominant) operating levels.*

	Local		**Regional**		**National***		**International**	
	public	private	public	private	public	private	public	private
Infrastructure designers			x	x	x	XX		X
Infrastructure builders		x		x		XX		X
Infrastructure operators	x		x	x	X	X		
Transport service operators (freight; passengers)	x	x	X	X	X	X		XX
(holders of) private cars, motor bikes, etc.		XX						
Non-motorised transport		XX						
Freighting clients		X		X		XX		XX
Storage; handling		x		X		XX		X
Tourism		x		X		X		X
Vehicle makers						X		XX
Support services (weather; routing; safety; …)					X	X	X	X

XX = clearly dominant; X = important; x = some (limited) role
*) focus area of the discussion in the break-out group, assuming the initiative is at the public side.

Red: inside transport system; **blue**: direct impact on size & quality of demand for road vehicle movements; **grey**: auxiliary services that strongly interact with effects of CC.

Various possible effects of climate change on road infrastructure and its users

The expected effects of a changing climate in Nordic countries imply among others a higher frequency of bad road conditions in winter, a higher frequency of more serious wear and tear of infrastructure and equipment, higher risks for large scale impact events (e.g. inundated

tunnels), as well as induced behavioral effects possibly entailing maladaptation[4]. According to a review study of the Swedish Road Authority[5] of all Nordic countries the Norwegian road system seems to be the most exposed to different adverse impacts of climate change, whereas the Finnish and Swedish exposure profiles are very similar[6].

Although a significant share of the weather impacts is already today taken into account in the design, a change in the strength and/or frequency of damaging impacts may cause a need to change road structures[7]. For example, trenches and bridges, and culvert structures of smaller roads have not been designed for high precipitation. Climate change will also have an effect on the routine and periodic maintenance of roads[8]. In order to keep the present level of service, there are needs for changes in the maintenance guidelines. Further development of warning systems for road users and information in trip planning are important ways to mitigate any negative effects of weather and climate.

Climate change may affect demand of road transport services directly, e.g. climate change may alter the supply chains in forest and food industries. The competitive position of road transport may change for better or worse, depending on how other modes respond to changing circumstances and risks, on the regulatory and costs effects of explicit adaptation policy, on the interaction with other policies (mitigation, clean air, urban zoning, safety etc), and on the ability of the road transport sector (incl. its infrastructure and supporting services) to co-operate coherently to find efficient and timely answers[9].

3. Deliberation of key questions regarding stages in adaptation planning

The set of seven questions is presented below in the text box. The synthesis of the discussion is however not purely organized in seven steps, as many issues re-appeared in the answering of different questions. Furthermore, various questions, notably no.1 and 2 require in fact joint consideration or stepwise answering, implying that the questions should be several times revisited before a coherent view emerges.

[4] For example, notwithstanding a long-term downward trend in Finnish road transport casualties the number of fatalities on roads in July 2010 was significantly higher than in previous years' July or in June 2010. Virtually the whole of July 2010 was warm to very warm in most parts of Finland, except Lapland.

[5] Presentation by Lennart Lindblom (Vägverket), based on a study for the Nordic Road Forum (NVF).

[6] Interestingly enough, actual cost incurred since 2000 due to effects of extreme weather events are significantly higher in Sweden than in Finland (Swedish Commission on Climate and Vulnerability (2007), *Sweden facing climate change – threats and opportunities*, Swedish Government Report, SOU 2007:60; in particular Chapter 4).

[7] Seppo Saarelainen & Lasse Makkonen: *Adaptation to climate change in the road management – Pre-study*. Helsinki 2007.

[8] The Finnish Road Administration (Finnra) (2009), *The effect of climate change on the routine and periodic maintenance of roads*, Finnra report 8/2009, (in Finnish, abstract in English).

[9] Salanne, i., Byring, B., Valli, R., Tikkanen, R., Peltonen, P., Haapala, J., Jylhä, K., Tolonen-Kivimäki, O., and Tuomenvirta, H., 2010: *Climate Change and Freight Transport*. Ministry of Transport and Communications – publication 15/2010. 98 pp. (in Finnish, abstract in English).

Text box – questions on which was deliberated in both parallel sessions

1. Which stakeholders should be involved and when?
Stakeholders are those who are directly or indirectly affecting or being affected by a management decision, either as individuals or groups of people or representatives of a group.

2. Who sets the agenda? Which levels and forms of stakeholder participation are required?
Levels of participation: 1) spread information / information), 2) receive information / consultation, 3) discuss / interaction), 4) engage / active involvement and 5) partner / co-decision making.

3. Which knowledge is needed regarding climate effects and the involved uncertainties, and how do we obtain such knowledge?
Knowledge is expertise, skills, what is known, facts, information and awareness or familiarity. Uncertainty can relate to framing, emission scenario, GCM, RCM, downscaling, local models etc.

4. Which action plans / adaptation scenarios are available and should be developed?
The groups should here describe how you arrive at decisions on possible adaptation scenarios to be developed and afterwards analysed. What you want to avoid, what could be achieved (SWOT etc.).

5. Which evaluations of effects of climate change are required?
Effects could be technical (flooding, droughts, pollution etc.), ecological (biodiversity, habitats, fish populations etc.), economic (GPD, private economy etc.) and social (jobs, vulnerability, risk etc.).

6. Which capacity is needed (policy makers, water managers, researchers)?
The capacity of policy makers for doing strategic planning, leadership and adaptive learning. End users and water managers' capacity for process initiation and adoption. Quality of research results.

7. How to assess when to enter a learning cycle and how to assess outcomes and progress?
How to assess the appropriate level of sophistication and complexity of decision process and methods? How to integrate adaptation solutions and how to evaluate outcomes of learning cycles?

With reference to the introductory presentation (see section 2) it was decided to answer the questions against the backdrop of the *national level of the road transport system*. Furthermore, it was acknowledged that for road infrastructure four stages of planning and policy can be distinguished:

1. Design, location and overall network coherence
2. Construction (technical specifications, exact location and qualities)
3. Maintenance (technical specifications, minimum quality standards for traffic, repair)
4. Operation (traffic flow operations, daily maintenance operations, etc.)

The first two concern long term planning and to a large extent set the boundary conditions for maintenance and operation. Given the long term nature of climate change it seems therefore logic to assume that the national and strategic level (items 1 and 2 above) should be handled first. Nevertheless, in the spirit of adaptive management it was stressed that the stages of 'maintenance' and 'operation' generate a wealth of up-to-date information on strengths and weaknesses regarding materials, systems, and procedures, which is valuable input for the strategic planning level. It was therefore decided to assume a two stage approach in adaptation planning for road transport, meaning that at least initially it is supposed to start at strategic level, with a subsequent second cycle at the operational and maintenance levels, including feedbacks upward.

In this respect it should also be realized that the relative importance of maintenance is increasing, as overall the national road system in most Nordic countries is only mildly expanding. As a consequence an ever larger share of the budget is going to maintenance, including major structural updating and reconstruction works of existing road sections. Reconstruction within a *existing* trajectory usually entails less extensive participative decision making as compared to a completely new route. This can be important as adaptation planning usually presupposes stakeholder involvement.

Other trends that probably affect adaptation planning in road infrastructure are the changes in ownership and operational responsibilities, including splitting of organizations and outsourcing to the private sector. Furthermore, technical innovations – partly induced by mitigation (e.g. electric cars) – may have significant effects in the future shaping of road infrastructure.

A Summary of the consideration regarding questions 1–7

Q1 / Q2

The selection of stakeholders, their extent and modes of participation, and the formulation of the agenda (of what should be considered and when) were regarded as intricately interwoven issues. At a national level some kind of prior notion of the overall problem and of the potentially involved stakeholders is either available or can be generated. This implies the existence of a kind of proto-agenda. On that basis an initial set of stakeholders can be identified, possibly with a very preliminary classification in terms of involvement. As a first step by means of consultation of the stakeholders some further specification of the agenda can be pursued. On that basis the relevance of various stakeholders and the ways and timing of involvement can be clarified. It should be realized that within the framework of adaptive management modifications can be made later on in the process.

At the national level the initiator and manager of the process will often be the national road authority. Possibly, due to existing regulations selection of stakeholders is following precise prescriptions. It is anyhow likely that representatives from other ministries, key economic sectors, road transport umbrella organizations, (national) land use planning authorities, environmental NGO's, citizen interest groups, etc. Experts will also be involved either hired to carry out assessments or as reviewers (possibly hired by stakeholder groups). It is very important to clarify the mandates of the different types of stakeholders in order to prevent disputes stemming from misperceptions of roles. Preferably, mandates by type of participant are pre-specified in legislation on participative decision making.

It is important to consider to what extent it would be possible to integrate adaptation planning with existing relevant policy cycles, such as for national road infrastructure plans, other infrastructure plans, national land use plans or visions, (national) water plans, and national energy plans.

Stakeholder involvement is often a delicate process. Even in well functioning democracies with established planning traditions social-economic power structures will somehow resonate in the stakeholder involvement. Often a few closely operating larger parties may be more effective than a large crowd, even if the latter represents in principle a majority. This is linked to the Paradox of Arrow, which essentially means that no perfect decision process is possible. Nonetheless awareness about the problem will help to restrict it. For example, in transport infrastructure planning interests of non-motorized modes and of those with limited access are often weak parties, for which representation merits to be safeguarded in the four stages mentioned. Depending on the time scale also future stakeholders may be considered as well as changing positions of various stakeholder groups, e.g. due to demographic changes.

Last but not least it is essential that the national authority which initiates and manages the adaptation planning and assessment process is working on the basis of a vision (e.g. objectives regarding function and quality of road infrastructure in 40 years[10]).

Q3 / Q4

Also between questions 3 and 4 considerable overlap and interaction exists. The scanning, analysis and scenario outline(s) implied by questions 3 and 4 should be guided by *a strategic view on what **quality of service** the road network should deliver in the next few decades while accounting for climate change*. The concept 'quality of service' is multi-dimensional and encompasses (at least) the typical objectives that can be found in Nordic road authority strategies or missions, such as: traffic safety targets, smooth traffic flow (or speed) targets, environmental targets (emissions to air and water, noise exposure), cost-effectiveness objectives (e.g. for operations, maintenance, and construction cost). The *aspired* level of service quality is subsequently to be tested on (probably) *achievable* levels of service quality as analyzed in various scenarios (see also question 5). Yet, prior to scenario based analysis of eventual impacts (on road infrastructure, and on key competing and complementing infrastructure), in this phase the points of departure and the storylines have to be developed. Scenario development requires both expert and stakeholder involvement.

The scenarios should be developed in such a way that the impact analysis in the next adaptation planning step (Q5) answers can be produced for the design and construction stages as well as for the maintenance and operation stages. The output (of Q5) entails key information on changes in physical circumstances and on changes in responsiveness and eventual impacts of the road system and its users, while accounting for technical developments and learning options. In order to produce meaningful outcomes for policy support the aspired service quality levels should be *credible*, whereas careful scanning of critical thresholds is a necessary ingredient.

[10] . Adaptation planning requires truly long term assessments and visions, i.e. 50 years and more. Yet, social-economically and in terms of governance 25 years is already a lot. Hence a compromise of e.g. 40 years.

Obviously, given the complexity of this kind of assessments the participatory planning process should allow for learning and revisiting of earlier (preliminary) defined objectives. This is what adaptive management aims at. Also the feedback from the stages maintenance and operation to the (strategic) stages design and construction will be very helpful to promote learning. It is fair to add that revisiting of earlier established definitions is often a critical point in participatory planning processes, in particular when reconsideration of earlier established objectives can be insisted upon too easily and/or initiated due to ambiguous guidelines.

Considering the precariousness of the exercises implied by Q3 and Q4 it was felt that first serious commitment should be ensured from the top management of the public agency leading the adaptation planning, as well as from the top management of other key stakeholders. This may require a preceding step of education on foreseen impacts. It may also require a review of regulation where it is a priori expected that current regulation may crucially obstruct changes.

Q5

All the effects mentioned in the question merit to be taken into account. Depending on the scale and scope of the adaptation plan the evaluation of these effects needs to be carried out while accounting for other (non-climate) scenario trends, such as for example, demographics, globalization, and mitigation policy interaction effects.

In order to make causal pathways understandable and elicit alternative adaptation solutions, it is important to distinguish between the initial effects of weather phenomena and the eventual implications for the road transport system, i.e. considering the automatic adaptation capacity and the system's coping range[11].

If only a causal pathway approach would be used (from initial effect to eventual road transport impact) the overview of the resulting risk for not achieving target minimum levels of service quality gets easily blurred. Therefore it is important to assess the impacts also from the point of view of the target minimum level of service quality of the road infrastructure. Different initial effects may lead to the same deviations in service quality.

Q6

Quite many different sorts of capacity (meaning both ability and resources) were identified. A prerequisite – as also mentioned earlier – is genuine commitment of the key organizations involved in the planning.

Obviously there should be a reasonable number of experts and amount of assessment resources (tools, data, etc.) available. Yet, the key players should also be prepared to acknowledge that substantial or even radical changes in course are necessary. In turn this requires the use of two types of creative resources, being innovation and managerial skills respectively. Without prospects for acceptable and feasible solutions policy makers may even wish to deny a problem[12] Innovations can help out at that point. Yet, in case more dramatic

[11] . It is possible that the automatic adaptation mechanisms eventually lead to situations that are outside the coping range of the system and consequently imply serious deviations from the target level of service quality.

[12] Dinkelman, G. (1995), *The Interaction between Problems and Solutions in Dutch Air Pollution Policy* (in Dutch), dissertation University of Amsterdam.

changes are needed in institutional frameworks also managerial skill can become a bottleneck regarding successful implementation of new adaptation plans.

Similarly to the managerial skills there is need for adequate review and update of existing legislation and regulations in order to prevent legal obstacles to change. Admittedly, this is only easy up to some point, as there may be other interests and legislative coherence at stake for some of the rules considered.

Q7

It is hard and probably also inappropriate to provide a generally valid answer. The judgment regarding sophistication and complexity typically unfolds via learning by doing and by borrowing from similar processes in other policy areas if more experience is available from there. Furthermore, when experience and knowledge accumulate the capacity of (most) participants to deal with more sophisticated methods and larger complexities will increase. Learning, notably at societal scale, needs its own time. On the other hand the speed of absorption of new knowledge and insights can be influenced via the amount of effort and budget a society is prepared to spend on research, education and communication regarding a particular issue.

Learning plays a role at various scales of policy preparation and implementation. There are the options to learn within one policy cycle, i.e. from monitoring (across scales), stakeholder deliberations, and specific R&D commissioned in that cycle. Yet, there is also meta-learning with respect to the policy cycle and process management as such. When starting a new cycle (of planning –> implementation –> monitoring –> review etc.) decision makers and stakeholders may wish to amend aspects of the architecture and requirements of the cycle, due to experiences in the previous round, new knowledge and tools, etc.

4. Accounting for adaptive management in the adaptation planning cycle

On the basis of the discussion of the above summarized questions, and with reference to the double loop scheme for adaptive management (see Annex 1), and several presentations[13] the planning cycle was condensed into a flowchart (figure 1).

As stated earlier the process starts with some kind of official mandate. Based on existing legislation or as part of the mandate guidelines for the planning process, including stakeholder involvement, may already be available. Usually this still leaves the core team of internal experts and process managers (usually of the ministry of transport) a lot of leeway how and whom (and when) to invite. The choice of stakeholders should correspond with the (foreseen) framing of the adaptation plan. Therefore it may be necessary to invite additional stakeholders later on. Stakeholders may be granted certain rights, often by law, regarding the course of the planning process, the transparency of choices made, and the evidence of provided input (see also figure 1). Yet, the participation and its procedural rights don't provide any guarantee that provided information, priority settings, etc. of particular parties have noticeable effect on the resulting definition of alternatives, even though participants often develop expectations to that

[13] E.g. the NONAM workshop presentation by Gareth James Lloyd, *What is the difference between adaptation and adaptive management,* downloadable from http://en.vedur.is/nonam/material.

effect[14]. This needs to be clearly communicated in the invitation and throughout the planning process. On the other hand this notion needs to be balanced against the effect that experiences as if participation does not make any difference should be minimized. Lack of participation during decision making may seriously affect later on formal acceptance and also actual policy implementation. Differences in effectiveness of participation are often related to large differences in capacity to grasp the entire theme area and consequences of choices.

Considering the discussion in the previous sections figure 1 should be largely self evident. A special feature is the insertion of a third party peer review of the scenarios and the analyzed dilemmas regarding aspired versus achievable service levels of the road infrastructure. Such a review aims to ensure a solid credibility and authority of the analysis and thereby at keeping the stakeholder deliberations constructive and solution oriented. Figure 1 also allows for the various learning cycles within the same planning cycle as well as in the long term for a new policy cycle.

[14] . The participants' misinterpretation of their mandates is a principal source of conflict and disappointment in participatory decision making regarding public policies and investments.

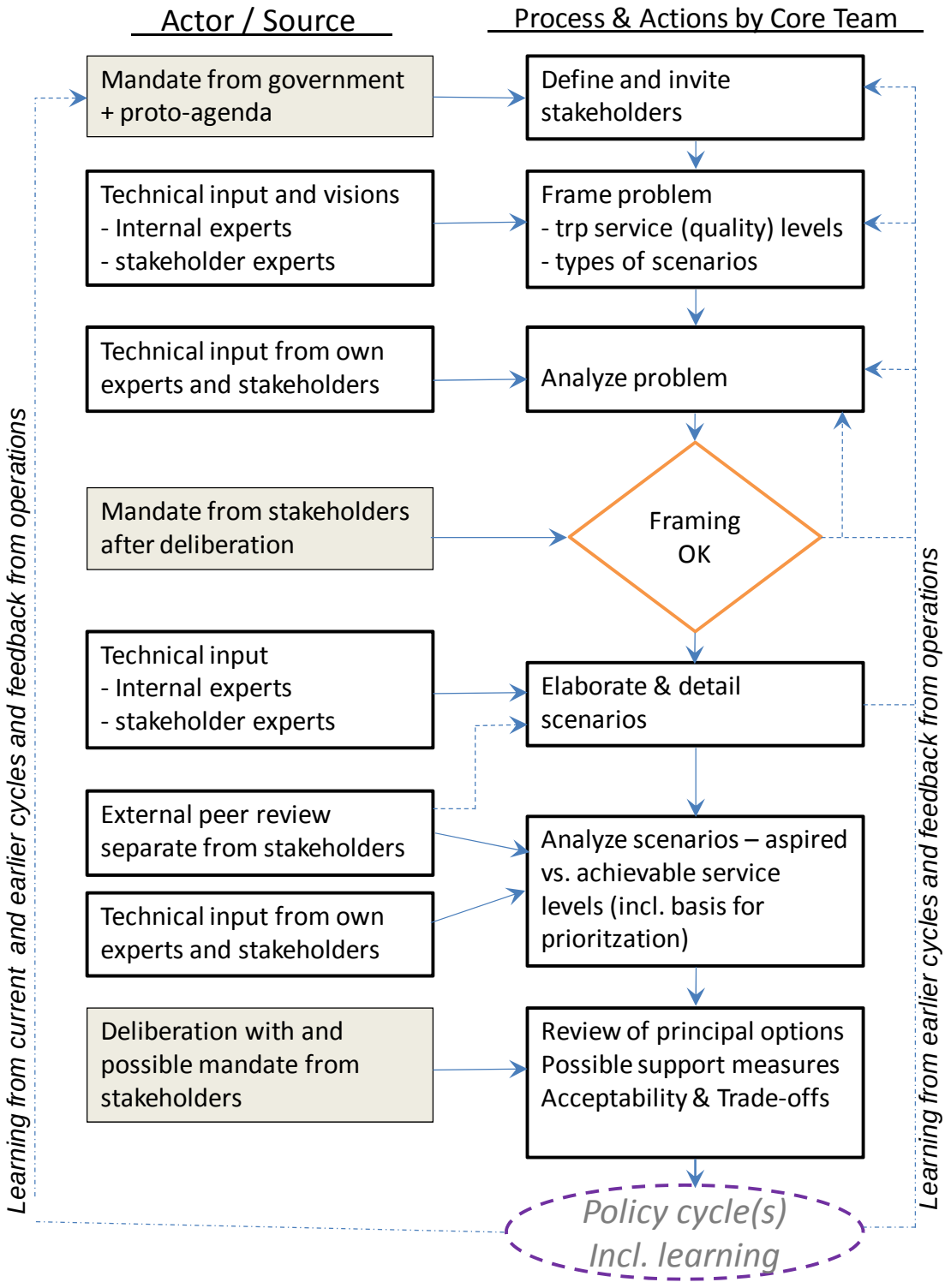

Figure 1. *Flow chart summarizing information and decision flows of an adaptive management inspired adaptation planning cycle for road transport (at national strategic / tactical level).*

Summary of the break-out sessions on Horsens case

By Hans Jørgen Henriksen (GEUS)

1. Context and aim of break out group sessions

The break-out sessions, three in total, were interspersed between the various oral presentations on Thursday afternoon, Friday morning and Friday afternoon. Each session was 60 to 80 minutes. The participants had two assignments:

3. deliberate 7 questions on issues pertaining subsequent stages of adaptation policy development (in an adaptive management setting) – the questions are listed below in Annex 1;
4. produce a flowchart of an adaptation plan (outline) based on the ideas of adaptive management (as synthesized in the 'double loop model') – see figure 2.

The first session started with an introduction to the sector / case considered, followed by a brief general discussion on the outlined features of the sector. The rest of that session was used to deliberate on questions 1 to 4. In the second break-out session the rest of the questions 5 to 7 were addressed. The third session focused on the generation of a flowchart. After the first and third session a plenary session was held in which a summary of findings of each parallel session was presented by rapporteurs and discussed.

2. Description of the case A Horsens Fjord case

What should we count in?

The challenges for the comprehensive Horsens case in the presentation material were subdivided into the following sectors/subareas:

- Industrial area owners (excess water, cooling, buffering and intelligent use of excess water)
- Farmers (drought prevention, flooded areas, irrigation, nutrients, financing adaptations)
- Hedensted upstream city (flooding risks, vulnerable to rising groundwater, excess water and recreational area management)
- Horsens city at the fiord mouth (rising sea-level, storm surge, city centre, flooding from catchment and rising groundwater level)
- Road and railway owners (undermining due to rising groundwater and flooding, need of knowledge about where to reconstruct / infrastructure part of adaptation)
- Nature (wildlife diversity threatened due to intensive land use, need to develop new biotopes)

Various possible effects of climate change on water and its users

Climate change is expected to further increase current problems in the Horsens case area. Temperature will increase, and more rain water and increased runoff is expected especially in the winter season. Sea level is also expected to increase and combined temperature increase and increased nutrient loads to the fiord and to the lakes is expected to further strengthen the challenges of implementing the goals according to EU WFD and its Daughter Groundwater Directive.

Materials for the break out session

- Pedersen, J., Johnsen, R. and Henriksen, H.J.: *Horsens Fjord case.* Introduction to the adaptive challenges in the comprehensive Horsens Fjord case. 15 pages.
- The folder: *"Vind over vandet"* (in Danish). Region Midtjylland. pp. 55 pages. Outcomes of 5+1 workshops 2009–2010 in Horsens.
- *A0 Map* of Horsens city showing 0.5–2.5 m sea level rise and flooded areas in the city centre.
- *A1 Sector conceptual maps* for each of the subsectors/subareas: Industrial area owners, Farmers, Hedensted town, Horsens city, Road and railways and Nature with a short identification of the adaptive challenge (e.g. as an example for Horsens town: Problem: Rising sea-level and storm surge is a problem to city centre, flooding from Bygholm river and rising groundwater level. Needs: Needs strategy to protect the city, to use excess water as an integrated and interesting part of the city "landscaping". Cleansing strategy for drainage of diffusely polluted groundwater, etc. for each sector/subarea)

3. Conclusions from the group A

The group had 12–16 participants during the three sessions, so it was decided to split the group into two smaller groups but sitting in the same room (see photo A), and having the same chairman (Jes Pedersen) and facilitator (Gyrite Brandt) to guide the work. The rapporteur (Hans Jørgen Henriksen) had the task of summarizing the results on the powerpoint sheet developed for each of the seven questions.

Each subgroup of 5–8 participants discussed each question. Then the two groups delivered their suggestions in the large group. Hereby, the other group could reflect on the results also, in order to merge the outputs of the two groups into a coordinated result for group A.

Photo A: Break out group A with two small groups, chairman and raporteur. Day 1.

Photo B: Break out group A and chairman. Day 1.

Answers to the seven questions

1. Which stakeholders should be involved and when?

- Depends on what to achieve, dikes/fiord
- Municipality, local government
- Citizens
- Farmer associations
- Affected farmers
- Train/Road owners/companies
- Everybody is affected (living, work, shops); we can't be completely sure about flooded areas, all actions will involve handling water outside flooded areas
- Local government / different branches (social/technical schools, kindergardens etc.)
- Different stages in planning cycle / different stakeholders and levels of engagement

2. Who sets the agenda? Which levels and forms of stakeholder participation are required?

- Municipality is key player in coordinating the process.
- Involvement process. 1. bring all stakeholders in, 2. narrow down, 3. feedback with broad group of stakeholders

3. Which knowledge is needed regarding climate effects and the involved uncertainties, and how do we obtain such knowledge?

- You can always act without information (don't be paralyesed by indecision)
- A1B up to 2050 emision scenarios (danger of under adapation)
- Storeytelling is good to create awareness and benefits of new solutions
- Don't build houses/buildings in flooding risk areas (based on historical knowledge to validate scientific predictions)
- Local robust models and translation of uncertainties into meaningful maps
- Experience from elsewhere that can be part of solution

4. Which action plans / adaptation scenarios are available and should be developed?

- We have to develop plans that are valid for 20 years / has to be updated regularly
- Adaptation plans for 20 years is not enough (sewer systems, infrastructure etc.)
- Emergency plans / robust solutions along river and sea

5. Which evaluations of effects of climate change are required?

- Happening now
- All issues mentioned in question and in addition, security and health issues. Economic crisis (pressures add up, how long can sociity compensate?)

- Lolland case illustrative (political instability in the future, social spiral?)
- Transboundary evaluations
- Risk indexes – aggregation of key indicators (combine factors like runoff and rainfall, nutrients to the fiord etc.)
- Temporary and permanent effects
- Economic damages – seasonality (depends on season)
- How does maps impact insurance issues (are there ethical issues?)
- Hazard action plans – specific procedures
- To produce procedures for remidiation after hazards
- Flush flushing versus more permant flushing may have different impacts

6. Which capacity is needed (policy makers, water managers, researchers)?

- Narrowing gaps between civic servants, experts, researchers, public etc. / Platform for cooperation
- Adaptive governance & transdisciplinary research (people from different expertises: political, hydrological, social etc.)
- Demonstration projects – workshops with participants from different sectors
- Physical capacity (disproportional spending of money in different sectors regarding risks acceptance)
- Building of mutual understanding (politicians and technicians, and local citizens)
- Raise acceptance of risk and uncertainty (no 100% garantie)

7. How to access when to enter a learning cycle and how to assess outcomes and progress?

- Important to draw people into cooperation even though they initially don't agree
- Realise that 100 % consensus is impossible
- Need to come to compromises (solutions)
- Planning cycle (step by step). Unable to move on, clear sign for entering learning cycle, use outcomes for solving problem (when can all agree, when can you ignore stakeholders)
- Solutions comes from mistakes also, boundary between two cicles is not so simple. Depends on scale of application and nation of hazards. Local culture very important.
- Assess progress with appropriate indicators (social, economic, political, technical etc.)

Flowchart

The group started to work on a flow chart by dividing the adaptation process into a number of steps. As the first step the group decided on: *1. Get people ready to go with adaptation.* The discussion in group A revealed that some of the tasks here should be carried out as part of the regular planning cycle (the upper loop of the double loop), others as part of the learning cycle (the lower loop). For instance as upper loop (regular planning cycle) tasks the following was

considered: (i) collect knowledge, (ii) prepare maps of climate change effects and flooding and (iii) getting a rough idea of funding. As learning cycle tasks the following was concluded: (iv) advertise in media and public meeting, (v) engage target group farmers and local municipality, (vi) gather the story of flooding from local people / interviews / media trawl, (vii) establish trust with locals, (viii) diagnose interests to lands, (ix) establish organization.

The group went on discussing a next step: *2. Create common vision*. The group here found that this would require a merging of the two loops, the regular cycle with the learning cycle. Task could be: (i) call everybody in and let them explore their visions about the area; playground, (ii) identify basic points of views and representatives, (iii) discover different win-win solutions between the sectors, (iv) recognize conflict interests up front.
The next step which the group considered was: *3. Narrow down viable solutions.* Here the group decided only to work on tasks related to the learning cycle part, and identified the following tasks: (1) scoping, (2) analyse gaps, (3) identify best solutions.

The fourth step which the group identified was: *4. Scenario planning.* No tasks were defined here. From having worked with this breaking down of the double loop in these four steps the group initiated a discussion whether the identified steps reflected the steps of the IWRM planning cycles. An analysis revealed that this certainly was the case. For instance the first identified step: 1. Get people ready to go with adaptation were comparable to the IWRM step "Establish status", the second step: 2. Create common vision more or less was comparable to IWRM step "Build commitment to reform", the third step: 3. Narrow down viable solutions had things in common with IWRM step "Analyse gaps" and so on.

At this stage, after having explored 3–4 steps, the group concluded that two possible and alternative routes for an adaptive long term planning cycle (20 years) could be feasible, either building on the: (I) Classical AM with double loop for addressing risks, problems and uncertainties, or (II) Classical AM but without double loop – based on the IWRM steps – with step specific learning cycle. A common concern from the group model building was a focus for better information exchange.

The group came to the conclusion that the most powerful approach, when building on the Horsens Fjord water case, should be as discussed for the first 4 steps the type II. In figure 1 the two basically different approaches is illustrated (scanned drawing by Garreth).

Performance Indicators

We didn't discuss this item in details, but Q7 discussion revealed that key here is to: "Assess progress with appropriate indicators (social, economic, political, technical etc.)".

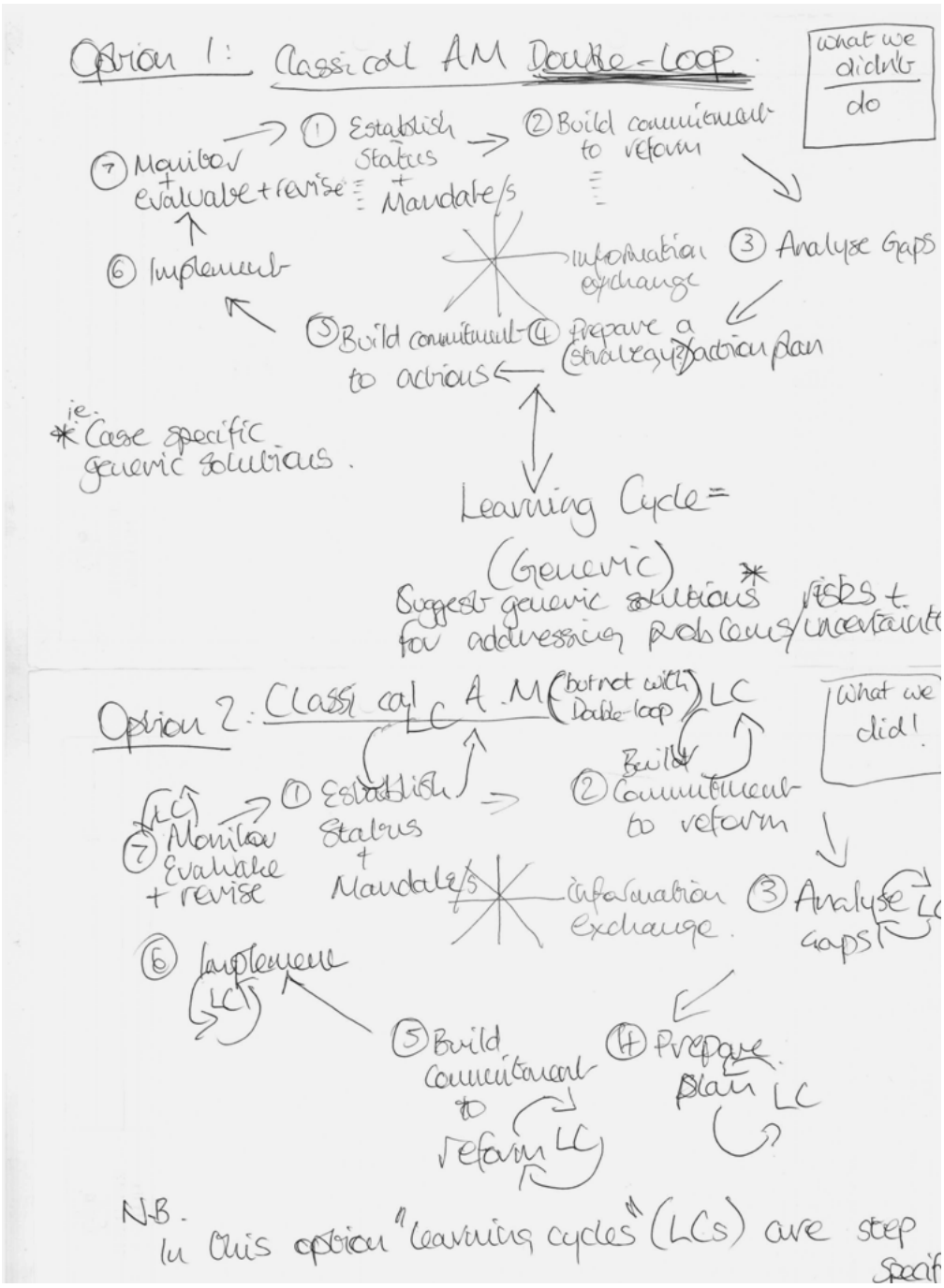

Figure 2. *The two different adaptive management approaches as identified by group A. Option 1 (upper): Classical AM double loop (as suggested by NEWATER), and Option2 (lower): Classical AM approach building on IWRM steps (as finally recommended by the group A) based on the work with the comprehensive Horsens Fjord water case, with step specific "learning cycles" for dealing with the adaptive challenges, uncertainties etc. Information exchange need to target all steps/stakeholders.*

Conclusion

Based on the discussions in Group A on the comprehensive Horsens Fjord water case the following conclusive '*modified IWRM flowchart'* (illustrated with green circles in Fig. 2), became the output of the groups work. Conceptually the elements developed as part of IWRM is retained, but climate change adaptation require that water management strategies evolve in ways that place a much greater emphasis on risk, uncertainty, stakeholder engagement and the ability to respond to change and inevitable surprises.

The discussions of the group followed the overall steps of a planning cycle (e.g. IWRM). The group in a way rejected the double loop (from NeWater used for the illustrating the learning cycle). Instead it was proposed that there should be 'outer' learning cycles between each of the IWRM steps, e.g. between 'Establish status' and 'Build commitment to reform' and so forth. Another important output of group A's discussions was the need for a better information exchange between each of the IWRM steps (often having different authorities and stakeholders) and the ongoing learning cycles. This is illustrated in the figure with the "inner learning cycle" and the information exchange to and from all the IWRM steps. This should also illustrate that a planning cycle is not simply subsequent steps, but that in a way all steps (or stakeholders and authorities involved in that step) should be informed, consulted, engaged and/or invited to co-decision making, also when it comes to the other IWRM steps, or the learning cycles in between.

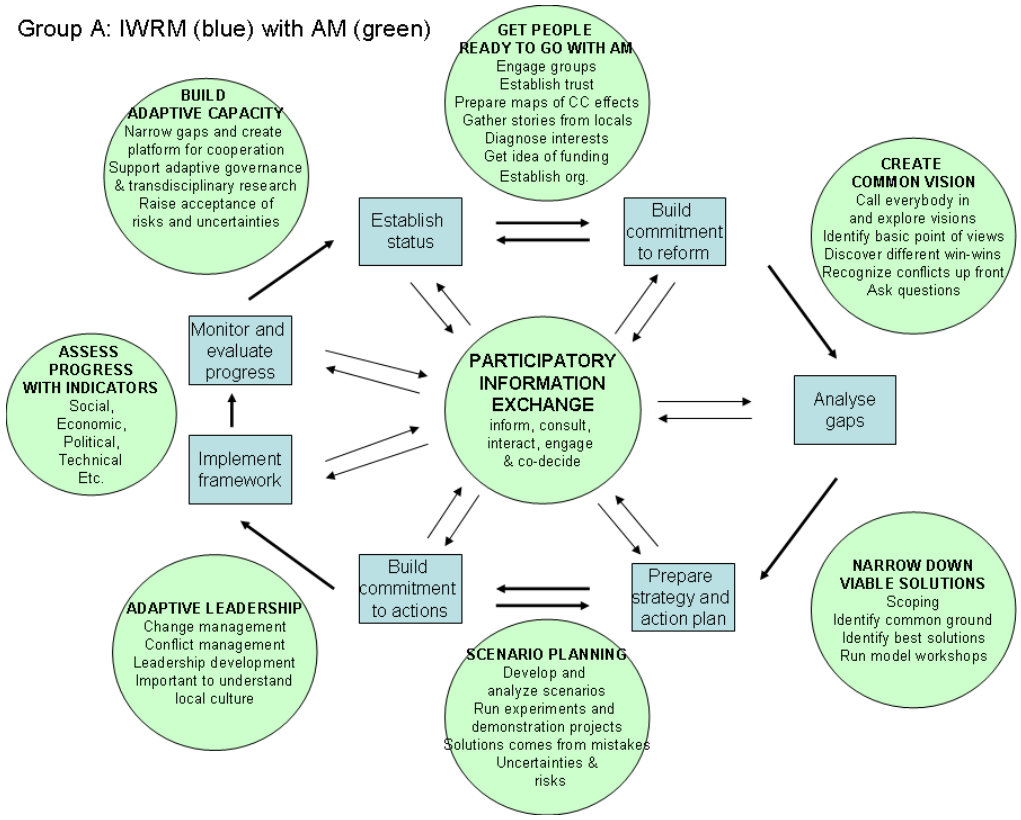

Figure 2 Conclusive figure from group A – Horsens case water. The blue boxes and the bold arrows corresponds to the IWRM cycle. The green circles and light arrows was suggested for the adaptive management learning cycles and information exchange.

Concluding remarks from the break out sessions – comparing the water sector and road infrastructure

By Adriaan Perrels (FMI) and Hans Jørgen Henriksen (GEUS)

Generally speaking adaptation planning in the water sector and road infrastructure has a lot of commonalities, as can also be inferred from the summaries of the parallel sessions. In many cases the same or largely the same methods and models can be used.

There are nevertheless also differences. For a start the water sector has already more experience with adaptation and seems to have made more progress in actually putting up national and regional adaptation plans and concomitant instruments. National road authorities have started more recently with developing comprehensive adaptation plans. Let alone that this would have already proliferated to other scales (regional, international[15]).

Other differences between these sectors that lead differences in planning approach are:

- differences in ownership structure and stakeholder structure
- differences in scale/scope
- differences in the distribution of external vs. internal effects
- differences in weight of environmental, social and economic functions and effects

Roads function as a network, which facilitates services (transport). Roads do not have value by their mere existence as such. On the other hand water has a trans-boundary nature, meaning also that water systems do not constitute infrastructure in the way that roads do, but instead have primarily a (natural) resource character. Water systems provide both natural and manmade services (drinking water, fish stock repository, tourism, shipping, irrigation, hydro power).

[15] Admittedly since mid 2009 a EU ERA-NET on roads and climate change exists.

Annex 1. Task of break out groups[16]

Adaptive management – learning cycles

Climate change introduces an additional factor of uncertainty into environmental policy making. It is no longer possible to rely on past experiences to determine future strategies and actions. Instead there is a need to pay due attention to uncertainty into environmental policy making, also with the need of more participation of stakeholders than in current planning processes.

This can be illustrated as shown in Fig. 1, as the need of introducing a systematic learning cycle to support the current planning cycle of the Water Framework Directive.

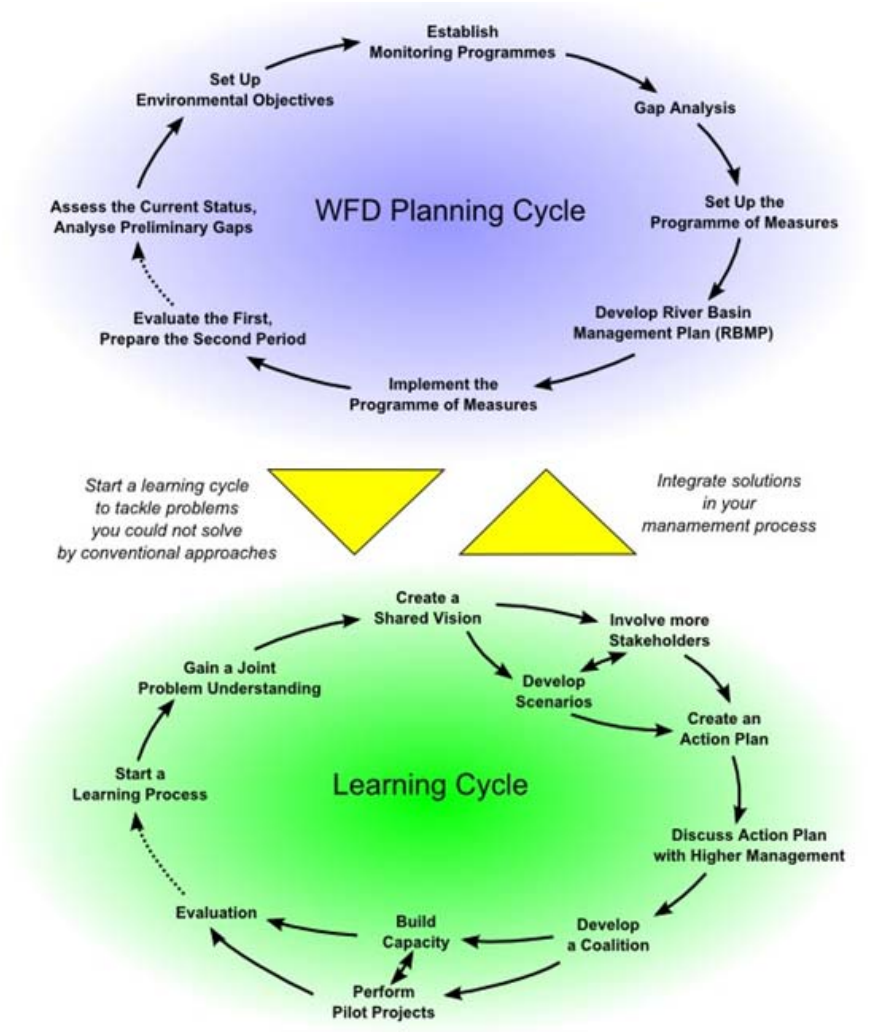

Figure 1. *Adaptive implementation of water policies (source: http://www.wise-rtd.info/). This example design of a learning cycle was suggested as part of the EU research project NeWater (www.newater.info).*

[16] by Hans Jörgen Henriksen and Jens Christiaan Refsgaard.

Objectives and expected output of group work:

Imagine that the group is a policy agency responsible for designing a long term (20 years) planning process that should enable the society to cope with the climate change effects and its uncertainties allowing sufficiently robust and flexible management practices. We would then ask the groups to produce two outputs:

- A flow diagram illustrating the different steps or actions in such a planning process
- A characterisation of the necessary conditions to be fulfilled for the various actors to engage successfully in such planning process

Each group must develop a design based on discussions and reflections in the group based on one of the two empirical cases:

- Group a) Local but comprehensive case Horsens fjord
- Group b) Road infrastructure planning and & operation case

Questions for work in break out groups

We ask you to progress by first discussing the following questions before you design the final planning process and characterise conditions to be fulfilled.

1. Which stakeholders should be involved and when?

Stakeholders are those who are directly or indirectly affecting or being affected by a management decision, either as individuals or groups of people or representatives of a group.

2. Who sets the agenda? Which levels and forms of stakeholder participation are required?

Levels of participation: 1) spread information / information), 2) receive information / consultation, 3) discuss / interaction), 4) engage / active involvement and 5) partner / co-decision making.

3. Which knowledge is needed regarding climate effects and the involved uncertainties, and how do we obtain such knowledge?

Knowledge is expertise, skills, what is known, facts, information and awareness or familiarity. Uncertainty can relate to framing, emission scenario, GCM, RCM, downscaling, local models etc.

4. Which action plans / adaptation scenarios are available and should be developed?

The groups should here describe how you arrive at decisions on possible adaptation scenarios to be developed and afterwards analysed. What you want to avoid, what could be achieved (SWOT etc.).

5. Which evaluations of effects of climate change are required?

Effects could be technical (flooding, droughts, pollution etc.), ecological (biodiversity, habitats, fish populations etc.), economic (GPD, private economy etc.) and social (jobs, vulnerability, risk etc.).

6. Which capacity is needed (policy makers, water managers, researchers)?
The capacity of policy makers for doing strategic planning, leadership and adaptive learning. End users and water managers' capacity for process initiation and adoption. Quality of research results.

7. How to access when to enter a learning cycle and how to assess outcomes and progress?
How to access the appropriate level of sophistication and complexity of decision process and methods? How to integrate adaptation solutions and how to evaluate outcomes of learning cycles?

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