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Next stop, implementation: collaborative monitoring to inform adaptive policy-making and implementation

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Abstract Dynamic Adaptive Policy Pathways has been developed as an approach to deal with deep uncertainties and support robust decision-making for long-term planning. Given the unpredictable and uncertain futures, implementation of the resulting adaptive policies needs to be informed by regular monitoring. However, monitoring implementation in practice is complicated by the need to coordinate activities and share information among multiple actors. Here we present a first outline for an approach to organise collaborative monitoring to support adaptive implementation of long-term water policies. The analytical basis rests on an extension of Dynamic Adaptive Policy Pathways with actor analysis principles. Monitoring is to be organised around adaptation tipping points, for which a set of questions needs to be addressed that put societal actors central. Examples from two water management cases in the Netherlands suggest the usefulness of this approach.

Key words Dynamic Adaptive Policy Pathways; uncertainty; implementation; collaborative monitoring; actor analysis; robust decision-making; adaptation tipping points; adaptive governance

INTRODUCTION

Despite scientific advances, predictive capacities to support long-term planning for integrated water resources management (IWRM) remain limited. Yet, decisions need to be made on water management infrastructures, investments, and regulations that cover long timespans. The acceptance of uncertainty as an inevitable part of long-term planning, has given rise to the development of new tools and approaches to deal with deep uncertainty and to support robust decision-making. These include Dynamic Adaptive Policy Pathways (DAPP) (Haasnoot *et al.* 2013), adaptive policy-making (Walker *et al.* 2001, Kwakkel *et al.* 2010), adaptation pathways (Haasnoot *et al.* 2012) and assumption-based planning (Dewar *et al.* 1993). These and similar approaches support decision-makers in dealing with uncertainty while planning for the future.

Long-term planning needs to be followed by implementation. In adaptive planning approaches, this implementation stage is not to be taken lightly. Given the unpredictable and uncertain futures, implementation needs to be adaptive. Regular feedback is needed to monitor if adaptations are required in light of emerging insights and developments. Most adaptive planning approaches offer guidance for this process, for instance in the form of signposts and triggers: indicators that are considered critical in dealing with uncertainty for adaptive implementation (Dewar *et al.* 1993, Walker *et al.* 2001). However, so far most approaches have neither been tested, nor further developed, to actually deal with adaptive implementation of long-term decisions in water management (e.g. Kwakkel *et al.* 2012).

Recent studies suggest that organising implementation and monitoring is as difficult as any other part in the IWRM planning cycle (Hermans *et al.* 2012, 2013). Easy answers are not around. So how can one support adaptive implementation of long-term policies, and how can collaborative monitoring arrangements help to facilitate collective learning as part of this process? This paper outlines an approach to organise collaborative monitoring to support adaptive implementation of long-term water policies. It first reviews the link between planning and implementation, before turning to how monitoring implementation could be organised, in a way that supports collaborative learning among actors in planning, implementation and adaptation of water policies.

PLANNING AND IMPLEMENTATION

Implementation requires that strategic policies and plans are translated into operational implementation arrangements. Strategic planning for integrated water management is difficult, and

implementation is no less complicated and does not involve fewer actors. Rather, it involves different actors, other organisational units, and other professionals. These actors work within constraints set by strategic policy decisions, but implementation is not necessarily easier. Conflicting goals may seem to be reconciled in fairly abstract policies and strategic planning documents, but that does not mean they do not re-emerge for the operators of reservoirs, pumping stations, or irrigation systems (see e.g. Van Eeten *et al.* 2002, Van der Zaag and Rap 2012). Implementation at the operational level requires professional judgement, interpretation, and adaptation to changing circumstances, unforeseen events, and emerging insights. It has long been known that implementation follows its own path and that top-down command-and-control approaches often do not work (Pressman and Wildavsky 1984).

MONITORING IMPLEMENTATION

Adaptive implementation is a balancing act. It requires sufficient room for localized and bottom-up decision-making, to adapt strategic guidelines to local (changing) contexts, while staying within the confines of earlier strategic level decisions. Adaptive implementation requires evidence, feedback information to learn about execution and impacts of activities. Such feedback is needed at the operational level and at the strategic planning level. Strategies need to be adapted as time progresses, new developments unfold, and emerging insights become available.

Collecting feedback information on implementation is typically done through monitoring. However, as implementation involves a range of actors, partly different from the actors involved in strategic planning, matching information supply and demand requires careful thinking. Developing a collaborative monitoring plan for implementation helps strategic planners and operational implementing agents to better connect (future) information demand and supply. The development of such a collaborative monitoring plan can be supported by an approach that builds on two main pillars: Dynamic Adaptive Policy Pathways and insights from actor analysis.

Dynamic Adaptive Policy Pathways: when and what to adapt?

Dynamic Adaptive Policy Pathways (DAPP) is an approach that combines adaptive policy-making with adaptation pathways. The approach helps to deal with deep uncertainty by identifying several Adaptation Pathways describing sequences of promising actions over time to achieve policy targets under changing conditions. A dynamic adaptive plan takes a long-term perspective and specifies actions that should be taken immediately, actions that are needed to keep future options open, and pathways that present alternative routes to get to the same desired point in the future (for instance, a safe and water secure delta). A monitoring system with related actions is to be set-up to keep the plan on the track of a preferred pathway (Haasnoot *et al.* 2013).

The monitoring system is based on signposts and triggers. Signposts represent variables that need to be tracked, whereas triggers are the values of those variables that would trigger an adaptive response. During the implementation of an adaptive plan, signpost information related to triggers is collected, and actions are started, altered, stopped, or expanded in response to this information. Responses are expected to be needed around certain adaptation tipping points: the conditions under which a policy starts to perform unacceptably (Kwadijk *et al.* 2010). Sell-by dates of policy actions are established, for different scenarios, to estimate when adaptation tipping points can be expected (Haasnoot *et al.* 2013).

Actor analysis: who is involved in adaptive decision-making?

Adaptive policy-making and implementation take place in a multi-actor setting. This means that the needs and interests of different actors should be taken into account in the organisation of these processes. Actor models suggest that there are three key attributes of actors that together help explain their (expected) behaviour (Hermans and Cunningham 2013). These are actors' values, resources, and perceptions: What actors *want*, what they *can do*, and what they *think* will happen if certain actions are taken. Two of these three attributes are represented in so-called "power-interest

grids" in the fairly common stakeholder analysis approaches. The third, perceptions, help to explain how power and interests of actors translate into their behaviour. Perceptions provide the causal reasoning of decision-makers whereby actions (what they can do) are connected to expected outcomes (what they hope to achieve).

PLANNING FOR COLLABORATIVE MONITORING USING A SIMPLE SET OF QUESTIONS

Combining the logic behind adaptation tipping points with actor-oriented thinking, five questions can be formulated that help to develop collaborative monitoring plans.

When are adaptation decisions expected?

What are the adaptation tipping points, and when are they reached? What are the predefined critical values of signpost variables (triggers) and what are expected sell-by dates? When are intermediate results to be expected? Monitoring is to be organised around adaptation tipping points. Furthermore, for long-term implementation pathways, policy-makers will want to know during implementation trajectories if they are still on track, if they are ahead or behind schedule, or if intermediate results are different from what was to be expected. Also, adaptation tipping points on a DAPP pathway may seem clear at the time of planning, but may be more difficult to observe in the future if there is no clear idea of associated signpost and trigger values.

Who decides about potential adaptations?

Who decides about how (not) to continue, how to transfer between policy pathways? Adaptation tipping points are not all similar in nature and they are taken by different parties. Some decisions refer to the instalment or modification of large-scale water infrastructures, others to changes in smaller units or in the operational use of those infrastructures. Adaptation decisions are not necessarily taken on a central platform. However, it will often be possible, and useful, to identify a limited number of actors that are likely to be involved in one way or another.

Who is impacted by those adaptation decisions?

In many cases, affected stakeholders are involved in strategic planning decisions. This is useful and needed, and needs to be extended to adaptation decisions. Those who are impacted are likely to respond. This includes actors active in operational implementation activities.

On what basis are adaptation decisions made?

What are the considerations decision-makers are likely to use, what are the mental models they (are expected to) employ in their decision-making? Decision-makers reason about how the system works. This reasoning needs to be "tested" through learning from experience where possible. In other cases, gaps in knowledge need to be filled. In these situations, monitoring is helpful to try and fill those gaps. Looking at critical assumptions enables such monitoring.

Who has access to data to inform decisions?

Who is well-situated and/or capable of collecting monitoring data and of providing information? Or, who should be responsible for collecting monitoring data, spending resources on monitoring? The actors with decision-making power are likely to be located at the strategic levels and will typically include (national) ministries, water resources committees and planning agencies. The actors with access to data to inform those decisions include scientists and researchers, but also local government agencies that work at the operational level, utility companies and operators. Different actors have access and insight into different systems and aspects, and therefore, a careful organisation of monitoring efforts is needed. This calls attention to issues of trust and questions of who benefits from monitoring, and who has to do the monitoring work. Monitoring requires resources. How much effort should one make to monitor all the identifiable knowledge gaps?

CASE ILLUSTRATIONS

Two short cases are used to illustrate that addressing the questions above is necessary and practically useful. It helps to make choices in the organisation of monitoring. For each case, some of the above questions are addressed to illustrate that the answers to these questions are not always self-evident. Cases are drawn from two earlier studies of the design and use of long-term monitoring systems in water policy-making in relation to the EU Water Framework Directive (WFD) and coastline management in the Netherlands (Hermans *et al.* 2012, 2013).

Long-term monitoring framework for EU Water Framework Directive in Delfland

The water board of Delfland coordinates the local implementation of the European Union Water Framework Directive (WFD). In planning cycles of six years, plans should be reviewed and updated, ultimately aiming for "good ecological status" of all designated surface water bodies by 2027. The implementation of WFD activities requires significant efforts from municipalities, whereas overall responsibilities for coordination are assigned to the water board. Prior to 2009, a first plan had been developed as a joint effort between regional partners for the period 2009–2015, and the question was how monitoring could help to inform implementation and future planning updates.

When and what to expect? Clear ambitions for 2027 had been established and for many activities targets had also been set for 2015, which marked the end of the first planning cycle. For instance, nature friendly river embankments were to be constructed and targets had been agreed on the length and area of such embankments to be realized by 2015. However, no intermediate implementation targets had been agreed upon. So on what basis would the partners to the WFD plan decide if implementation was on track after one year, or at midterm, by 2012? The absence of intermediate targets over time came as a surprise to the planners involved in preparing the regional plans for the WFD. Establishing this information for a monitoring plan would not be self-evident. Even if actors had agreed on measurable long-term objectives for the WFD plan, specifying shorter-term intermediate targets presented another challenge.

What was clear, was that immediate results from these measures would not be visible due to delays and threshold effects in the functioning of the ecological system. This also made it virtually impossible to decide when to start worrying about the absence of visible effects prior to 2027. Also, it was not clear what intermediate actions would be needed, and by when. Planners had been aware that "adaptation tipping points" might exist, but they did not know when to expect them or how to recognize them.

Who decides about adaptations? Decisions are dispersed, and there is not always a clear decision platform. The EU promulgated the WFD. Europe also decides on the acceptability of voluntary schemes whereby farmers are paid for activities that benefit the environment and water quality. A regional water board decides if it wants to use such instruments as part of the implementation of the EU Water Framework Directive, and whether or not to continue or expand such practices. A farmer decides if he accepts and wants to participate in such voluntary schemes.

Who has access to information? Activities for which municipalities were needed included the connection of rural areas to sewerage facilities and the reservation of sufficient land area for nature development, including areas for the aforementioned nature friendly river embankments. Of course, municipalities knew about their activities and they could observe the impacts thereof. But were they willing to collect and deliver detailed data on such developments for further analysis by the water board? Or would they be willing to process and analyse such data themselves? Did they have the expertise to do so? And if they would be willing to deliver "tailor-made" monitoring information, could this information be trusted to be accurate?

Also, the discussion on connecting rural areas to sewerage facilities had been running for a few years already, and in the past, municipalities had sometimes promised results that they could not deliver in the end. So previous shared histories among implementing parties and issues of trust would also colour the discussion on collaborative monitoring activities.

Coastline management in the Netherlands

In coastal management in the Netherlands, a landmark decision was made in 1990 to pro-actively maintain the Dutch sandy coastline, and to do this using the natural dynamics in the coastal system. Twenty years later, in 2010, a decision was reached about the construction of a new large temporary water defence structure called the sand motor. This can be seen as an innovation and adaptation of the earlier 1990 decision.

Who decides about adaptations? Who made the adaptation decision to construct the sand motor in 2010? One might expect a key role for national government, as it was the official authority for decisions about how to maintain and preserve the national coastline, and about any major changes to it. Also, water boards were among the "usual suspects", as they were responsible for maintaining the regional coastal defence structures in the Netherlands and deciding about what was permitted in dune and adjacent beach areas, in terms of economic activities and (semi-) permanent building structures (hotels, beach pavilions, roads, offices, parking garage, etc.). Finally, the province had a minor role in coastal management, due to their responsibilities related to spatial planning and in the official institutional supervision of water boards.

In this case, the sand-motor decision was made by national government, in the form of the Minister of Infrastructure and Environment, but co-decided by the provincial government of South-Holland (the sand-motor is located within this province). The Province had, in many ways, facilitated and encouraged this decision. Initially, the province had been interested in seaward land reclamation and in added recreational value to the southern part of its area. The Ministry had an interest in a cost-effective maintenance of the Dutch sandy coastline. During the decision process, innovation considerations also came to play an important role, partly fuelled by a high-profile innovation platform chaired by the national Prime Minister. The sand motor would provide a high profile and visible innovation, whereby more conventional schemes of smaller annual sand nourishments would be replaced by large scale nourishments once every 20 years. It was, and is, presented as an innovative experimental intervention, to see if natural forces could be used to distribute the sand along the coastline to preserve long-term coastal safety. As such, it was considered a part of the innovative philosophy of "building with nature". If the most logical decision-making route had been followed, the decision would have been routed through the ministerial Rijkswaterstaat agency. In this case, the sand motor decision arguably would not have been reached, at least not in 2010.

Who is impacted? The decision to construct the sand motor impacted all the parties involved in maintaining coastal safety. Furthermore, recreational interests were at stake, although the impact of the sand motor on recreation was unknown. It might attract additional visitors, but it might also lead to more dangerous currents for swimming and to siltation of beaches to the north. More unexpectedly, it also turned out there was a potential impact on drinking water sources in dune areas that affected a drinking water utility. Also, the envisioned location of the sand motor would render recent investments in pumping capacity by the local water board useless. As a result, changes had to be made to accommodate these local needs in deciding on the exact location and implementation design of the sand motor.

On what basis are decisions made? Next to safety, the importance of ecology and recreation has long been recognized, as early as the principal policy decision taken in 1990. However, there was no structural monitoring arrangement to ensure information on ecological and recreational impacts; at least, not until around 2009. This lack of information meant that the decision to change existing practices by creating a sand motor in 2010 was taken under more uncertainty than would have been necessary. In part, this deficiency is now being addressed. For instance, the development of vegetation and animal species in different zones around the sand motor area are being monitored. In part, monitoring efforts are still modest when it comes to impacts on recreation, now focusing mainly on the number of visitors to the sand motor area. In this regard it is important to notice that recreational values and the general attractiveness of the region were key drivers for the province to support and champion the sand-motor decision.

Who should spend resources on monitoring to inform decisions? In direct relation to the above, the virtual absence of monitoring information on the impacts on nature and recreation of the coastline management policy under implementation since 1990 could be explained by considering the key actors involved and their interests. The main actors with an interest in nature did not have the resources, and did not spend too much energy on securing such resources to monitor ecological impacts. They responded mainly to the signals they received through complaints and reported incidents. This only changed in recent years. As a result of growing pressures from nature conservation groups, an agreement was signed between Rijkswaterstaat and these groups in 2009 to ensure regular monitoring of ecological impacts of sand nourishments.

CONCLUSIONS

Uncertainty and long-term planning horizons demand adaptability. Different approaches have been developed to support long-term robust decision-making. Now it is time to start thinking about facilitating implementation of adaptive plans. Connecting planning to implementation activities is difficult. Joint planning of monitoring arrangements offers a way to link these two worlds. The concepts of adaptation tipping points and associated signposts and triggers can be combined with key attributes of actor models and this suggests five key questions to structure collaborative monitoring discussions. Illustrative examples suggest the usefulness of this set of questions. At this stage, this is still a conceptual device, which has not yet been applied systematically to a single existing case. Developing such a proof of concept is a logical next step towards implementation and monitoring of adaptive plans. A first obstacle: obtaining the necessary commitment among decision-makers to extend their scarce organisational resources to carefully think about, and develop, collaborative monitoring arrangements.

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