

## **Adaptive multi-level governance through social learning: River Basin Management in the Netherlands**

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### **Abstract**

This paper presents a case study of a new adaptive, multi-level governance approach for river basin management designed to stimulate social learning and to be adjusted based on lessons learnt and changing political and economical context. The floods of 1993 and 1995 in the Netherlands and climate change triggered a paradigm shift in flood management. The 2.3 billion Euro flood safety programme Room for the River was launched to increase flood safety by giving the rivers more room instead of merely enforcing the defence systems. This programme is studied as a major stepping stone in the transition to integrated flood risk management and spatial planning and stimulating multi-level governance and multi stakeholder decision making. This research analysed how the programme was organised to draw lessons on adaptive multi-level governance. It comprised: 55 qualitative interviews, a survey amongst professionals and politicians (n=152) and extensive document analysis. First results indicate that the governance architectures of Room for the River were designed with flexibility to accommodate these new approaches finding a balance between short term project delivery and a long term process of adaptation. A flexible framework was adopted based on social learning that stimulated adjusting collaborative working and decision-making processes based on lessons learnt. Moreover the governance approach could adapt to the changed economic situation and changing political views on integrated flood risk management, climate change, and management of large-scale infrastructure projects. The social learning

approach proved effective in programme delivery and especially in stimulating these broader transitions.

## **1. Introduction**

Learning and adaptive governance have been the focus of much scholarship in flood risk management. Flood risk management is going through a transition to policies focussing on reducing the exposure and vulnerability to floods: ‘living with water’, rather than merely on reducing the hazard probability: ‘fighting against water’ (e.g. Zevenbergen et al, 2008). It is increasingly recognised that engineering alone cannot accommodate the future frequencies and impacts of flooding and a shift in emphasis is required from hard structural solutions to a mixed integrated approach that consists of both structural and non-structural responses. Among the non-structural responses land use planning is considered as one of the most crucial in managing exposure and vulnerability to floods (Wheater and Evens, 2009). As physical interventions to reduce flood risk need to be incorporated in spatial planning, they need be aligned with objectives ranging as broadly as: housing; nature; economics; water quality; transport; etc to increase the political and economical feasibility of its implementation (White, 2010; Veerbeek et al, 2012). Moreover, flood risk management has to incorporate adaptive strategies to deal with climate change and related uncertainties (Adger et al., 2005; Milly et al., 2008). A transition to integrated adaptive flood risk management requires a broad range of learning (e.g. Pahl-Wostl, 2009). Scholarships are emerging to better understand: the performance of flooding systems (e.g. Flikweert and Simm, 2008; Jonkman, 2007); potential measures and their performance (e.g. Van Ree et al, 2012), flood risk management strategies to deal with climate adaptation (e.g. Gersonius, 2012) and governance arrangements for participative planning and collaboration between more stakeholders and disciplines (Van Herk et al., 2011).

Various authors have developed conceptual frameworks for learning and adaptive governance (Armitage et al., 2008; Steyaert and Jiggins, 2007; Pahl-Wostl, 2009; Folke et al, 2005). They focus mainly on learning at a regime level to change paradigms, institutional and policy structures and or to the adaption of the system to uncertainty and changes. However, adaptive governance is to be delivered in practice through subsequent policy and investment projects and programmes that embrace integrated and

adaptive flood risk management. A gap is observed between these scholarships and practice related to learning in actual policy and investment projects and programmes to improve the governance arrangements of these very same programmes. Few case studies are available on learning within individual programmes or from one project or programme to the next. As Armitage et al. (2008, p87) ask: "if learning is acknowledged as being of central importance to adaptive co-management and related governance models, why is it usually employed in an everyday, familiar sense with little detailed examination?". Folke et al. (2005) recognized that successful adaptive management can be characterized by continuous testing, monitoring and re-evaluation. Also, literature on project and programme management provides no evaluation or guidance on the importance of learning. Rijke et al. (subm) only recently stressed the importance of learning for programme adaptation and governance as a success factor for effective programme delivery. And on a regime level, those contributing to a transition need these lessons for iterative adjustment of governance practices (Loorbach, 2007).

This paper aims to contribute to scholarship by analysing how learning contributed to delivering adaptive flood risk management in practice. More specifically, how governance arrangements and approaches stimulated learning and how this learning can be used to adapt programmes to deliver integrated and adaptive flood risk management in practice. The 2.3 billion Euro flood protection programme Room for the River (RftR) in the Netherlands is being used as a case study, as the programme is corner stone in the transition to integrated and adaptive flood risk management in the Netherlands (Van Herk et al, 2012b). The programme has an exceptionally high performance in terms of project output, stakeholder satisfaction, budget and time (Rijke et al., 2012b) and learning and programme adaptation have been identified as success factor (Rijke et al., subm). The practical relevance of this research reaches beyond Room for the River and flood management. It analysis how governance arrangements and approaches can stimulate learning and how this learning can be used to adapt programmes to deliver on their objectives.

## **2. Theoretical framework to evaluate learning outcomes for fit-for-purpose governance in programmes**

This paper draws on a large body of emerging, partly overlapping scholarships in

adaptive governance, social learning and programme management.

Adaptive governance and adaptive (co-)management literature comes from the domain of ecosystem management. E.g. Folke et al. (2005) and Pahl-Wostl et al (2007) base their work on the recognition that ecosystems are complex adaptive systems and the necessity to address uncertainty. Adaptability then refers to the capacity of actors to reorganize the system within desired states in response to changing conditions and disturbing events. 'Uncertainty' in flood risk management is recognized in predictions of rainfall, river discharge and storm surges that can no longer be based solely on historical data (Milly et al., 2008). Disturbing events comprise extreme climate events exceeding certain norms or standards that provoke flooding (Gersonius, 2012). Adaptation are intended to avoid such disruptions of systems and thus reducing their vulnerability (Kates et al., 2012). Adaptive management comprises the capabilities of governance arrangement to adaptively manage resilience and deal with uncertainty and disturbances (Berkes et al., 2003; Lebel et al., 2006). Adaptive management is an on-going structured and reflexive learning process that allows for constant adaptation of the management practice to deal with the uncertainty of social-ecological development (Lee 1999, Sendzimir et al, 2007). New approaches embrace uncertainty by iterative processes of adjusting interventions to achieve better outcomes over time. These approaches address the weakest links in existing systems (Kwadijk et al, 2010) and seize opportunities offered by spatial planning, land development and or natural processes (e.g. Gersonius et al., 2012; Veerbeek et al., 2012, Van Herk et al., 2011).

There is a growing recognition that besides adapting the physical ecological system, also the social and governance system themselves need adaptation. Dealing with (system) uncertainty and change requires organizational and institutional flexibility to reorganize (Folke et al., 2005). Again, the focus of adapting governance arrangements is focused on the ecosystem changes: Adaptive governance is based on a balance between robust institutions for a stable system performance under 'normal' conditions and flexibility to adapt to 'excessive' circumstances (Folke, 2006; Folke et al., 2005). However, adaptive governance also requires continuous learning and adjustments. Pahl-Wostl et al. (2007) define adaptive and integrated management as a structured process for improving systemic management policies and practices by learning from the outcomes of implemented management strategies. Voß et al. (2006) refer to reflexive

governance that comprises participation, experimentation and collective learning. Mostly the need for learning and changing governance systems is positioned in transition literature. Integrated and adaptive water management faces many persistent barriers that require regime change or more fundamental change to governance (e.g. Van der Brugge and Rotmans, 2007; Wong and Brown, 2009; Van Herk et al., 2011). For example institutional structures were created separating policy making and implementation of water management from spatial planning. Much less attention is given to the design of appropriate governance arrangements for specific policy and investment programmes for which only just recently Rijke et al. (subm) introduced a more operational fit-for-purpose governance framework. They highlight that practitioners and policy makers are facing challenges of determining: (1) the purpose of governance; (2) the contextual conditions in which governance takes place; and, (3) the effectiveness of different governance strategies (Rijke et al., 2012a). That emerging body of scholarship can be enriched by incorporating concepts of learning and reflexive governance. These 3 aspects need to be regularly evaluated in order to learn and be able to correct errors from routines, adjust values and policies and (re-)design governance norms and protocols through learning (Armitage et al., 2008; Huntjens et al., 2011). Also in project management literature the need for learning and management adaptation has only emerged the last years. Shehu and Akintoye (2009) recognised the importance of incremental programme design and adaptation to changing contexts. Because programme management contexts are complex, programmes should be organised as complex adaptive systems (Ritson et al., 2011). Rijke et al (subm) introduced and verified 'programme adaptation' as new success factor for effective programme management. Also in programme management literature, the need and mechanisms of learning and adapting governance arrangements needs further conceptual work and empirical evidence.

Social learning has received much attention in adaptive governance and transition literatures. Particularly because of its importance to deal with uncertainties and to deliver regime change. Armitage et al. (2008) give an elaborate overview of learning in the context of adaptive co-management and Pahl-Wostl (2009) for transitions. Both have contributed greatly by working through a vast body of scholarships that use different and overlapping definitions, concepts, assumptions and approaches that they recognize difficult their application and comparison. A learning typology and possible

evaluation framework of social learning distinguishes: single loop learning, double loop learning and triple loop learning. These concepts have been developed by King and Jiggings (2002), Hargrove (2002) and Keen et al. (2005) and have been adopted and applied by many in different ways (See Table 1).

	Huntjens et al.,2011; Pahl-Wostl, 2009	Flood & Romm (1996)	Tuinstra (2008)	Farrelly & Brown (2011)	Armitage et al. (2008)
Single loop learning	Refinement of established actions	Do things right	Instrumental learning adopting new knowledge to existing frameworks of objectives and causal beliefs	Technical learning to achieve objectives	Change actions and strategies
Double loop learning	Changing guiding assumptions / reframing	Do the right things	Change beliefs, norms and objectives	Conceptual learning that reconsiders objectives	Change values and policies
Triple loop learning	Regime transformation or paradigm shift in the structural context.	Power imposing values and norms or vice versa	Learning the ability to learn itself.	Social learning for transformation from technical to conceptual	Change governance norms and protocols that predicate single and double loop learning

Table 1: different interpretations for learning typologies: single, double and triple loop learning

For the purpose of this paper the evaluation framework needs to relate learning to adjusting fit-for-purpose governance arrangements in individual programmes. Most scholars classify changes to governance as triple loop learning, but then refer to fundamental regime changes. Contrarily most authors focus single loop learning on actions, and not on governance arrangements. Hence, the loop typology has not sufficient explanatory power for adjusting governance arrangements within a programme. We select and adopt the classification of learning outcomes by Knight and Pye (2004) because it explicitly addresses changes to governance structures as one category ‘structures’ and because their framework is applicable for a single programme.

The framework presents learning outcomes on 3 levels.

- Learning in terms of changing *interpretations* refers to the dominant philosophies or paradigms. For this research they are related to flood risk management, spatial planning, project management or multi-level governance.
- Learning outcomes in terms of changing *structures* are the patterns that are being (re)designed or that emerge from governing activities of social, political and administrative actors (Kooiman, 1993). These patterns comprise the governance arrangements to manage a programme or project, to organise networks of actors and institutional frameworks.
- Learning in terms of practices comprises cognitive and behavioural learning related to working together in a programme or project on flood risk management and spatial planning.

### **3. Research approach**

The purpose of this research is to analyse how learning contributed to the design and adjustment of governance arrangements to deliver integrated and adaptive flood risk management in practice. The 2.3 billion Euro flood protection programme Room for the River in the Netherlands has been selected as a case study for several reasons. The programme is corner stone in the transition to integrated and adaptive flood risk management in the Netherlands (Van Herk et al, 2012b). The programme has an exceptionally high performance in terms of project output, stakeholder satisfaction, budget and time (Rijke et al., 2012b). And learning and programme adaptation have

been identified as success factor (Rijke et al., subm). This programme, as many other large investment programmes, has a long duration that requires adapting to deal with changing internal and external complexities (Hertogh et al., 2008; Hertogh and Westerveld, 2010). The initiation phase of the programme started in 1999, the formal Programme Decision by Dutch parliament was made in 2006 and realisation is foreseen in 2015.

Firstly the governance arrangements that have been designed and implemented have been analysed, as well as the adjustments and further detailing of these governance arrangements during the programme. For this an extensive document analysis was conducted of formal policy and programme documents, as well as periodic update reports and meeting notes. In 55 face-to-face semi-structured interviews all respondents were asked for further clarification on the governance arrangements on different levels. The multi-level-governance arrangements that are inherent to the programme comprise structures and processes to govern: the relationships between the Dutch Government and Parliament and the Programme Directorate; between the Programme Directorate and each of the 39 projects comprising the Programme; and on each of these 3 individual levels (Rijke et al., 2012b; Van Herk et al., 2012a). Based on this first analysis it clear distinction was found between governance arrangements that were chosen during the initiation phase based on lessons from previous programmes and those that were adjusted or created during the design phase. The former comprised many examples of double loop and triple loop learning related to an on-going transition in flood risk management, spatial planning and programme management in the Netherlands. The later included changes in interpretations, structures and practices that were deemed necessary as new problems and challenges arose; new knowledge and insights were generated and problems were reframed. Hence Section 4 is subdivided in these two phases that present a selection of examples.

Secondly the reasons behind the selection and adaptation of governance arrangements were analysed. Interviewees were asked what learning outcomes and mechanisms contributed to these governance designs. Additionally the researchers observed 3 training sessions with 45 participants, 2 political conferences with approximately 220 participants and 1 community-building event to share lessons learnt from the Room for the River Programme with approximately 150 participants. The learning outcomes that



have been encountered have been classified according to the framework as developed in Section 2. For each phase the outcomes in interpretations, structures and practices and their effects on governance arrangements are presented in Section 3. The learning mechanisms are discussed in Section 4.

Thirdly the effectiveness of the programme has been analysed using a quantitative survey (n=152). Rijke et al. (2012b) and Van Herk et al (2012a) discuss the effectiveness in terms of project output and stakeholder satisfaction, whilst Van Herk et al (2012b) analyse the effectiveness in terms of outcome and the contribution to transitions extensively. In this paper specific insights on the importance of learning and governance arrangements will be highlighted.

#### **4. Case Room for the River**

##### **4.1 Initiation phase 1999-2006, learning from previous projects to design governance arrangements**

###### ***Interpretations***

The floods of 1993 and 1995 in the Netherlands and increased attention for climate change triggered a paradigm shift in flood management. The 2.3 billion Euro flood safety programme Room for the River (RfR) was launched to increase flood safety by giving the rivers more room instead of merely enforcing the defence systems (Van Herk et al., 2012a, Rijk et al, 2012a). The programme is to be delivered in 2015 to increase the river discharge capacity from 15.000m<sup>3</sup>/s to 16.000m<sup>3</sup>/s by river widening measures. The Programme comprises of 39 measures or projects for giving more room for the rivers Rhine, IJssel, Waal and Lek. 152 survey respondents state on average that Room for the River has had a high to very high influence (4.24/5<sup>1</sup>, with a standard deviation of 0.82) on river widening as a new solution for flood safety in the Netherlands. River widening measures, such as flood by-passes, excavation of flood plains, dike relocation, and lowering of groynes, have a stronger spatial component than traditional measures such as dyke reinforcement alone. Hence, a second objective was set for the Programme. ‘Room for the River’ explicitly aims to increase flood safety

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<sup>1</sup> where 1. is a very unimportant and 5. is a very important

combined with increased spatial quality of landscape, nature and culture (Schut et al., 2010). This double objective has been one of the most important success factors in the realisation of the programme (4.03/5, with a standard deviation of 0.66). New governance arrangements were deemed necessary to deliver river widening and reach both objectives. River widening and setting the explicit objective of spatial quality required the involvement of a broader involvement and active participation of stakeholders, especially regional stakeholders with interests and competences in spatial planning.

Previous large scale infrastructure projects such as the High Speed Rail Line and Betuwe Rail Freight Route had significant cost overruns and time delays because of regional opposition (Hertogh et al., 2008). These experiences led to a new view on participatory planning with regional stakeholders. The Ministry of Infrastructure and Environment and Rijkswaterstaat, their executive arm, had also commissioned and managed these previous projects and felt a new collaborative approach was necessary for successful delivery of Room for the River. Thus it was decided to engage regional authorities and entrust them a leading role in the planning and execution of the 39 individual measures. Dutch Government assigned the implementation of the Programme to the Programme Directorate (PDR) and commissioned the planning and delivery of the 36 individual measures to local and regional authorities. The governance arrangement of central boundaries, with decentral leadership was considered an important success factor that was rated with an average 3.84 out of 5<sup>2</sup>. The effect of this governance arrangements reaches beyond the programme as Room for the river has had a high influence on a more narrow collaboration between authorities: 3.84/5. As such RftR was a positive example for the national commission Elverding that urged large infrastructure projects in the Netherlands in 2008 to apply improved planning processes for faster and better results especially through earlier participation of stakeholders (Commissie Elverding, 2008).

Besides designing for regional ownership and support, additional governance arrangements were deemed necessary as the 'interpretations' towards programme management had changed. The national commission Duivesteijn that had evaluated the

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<sup>2</sup> where 1. is a very small influence and 5. is a very high influence

High Speed Rail Line and Betuwe Rail Freight Route in 2004 concluded that project controlling was not strict enough and that more accountability was necessary (Commissie Duivesteijn, 2004). The national government felt 'it cannot go wrong again this time' and wanted more insight and control on project progress. Room for the River became a so-called 'Large Project' for Dutch Parliament; a newly created status that required 6 monthly updates to Parliament to improve transparency and accountability. The underlying management philosophy was 'controlled trust': "We (the Dutch government) trust you (regional authorities) will deliver, but we will control you (via the PDR)". Survey respondents scored the importance of clear objectives and strict project management at 3.99/5.

### **Structures**

Lessons from previous projects led to new interpretations of river widening, integration of spatial planning and flood risk management, participatory planning and project management, and also, in parallel or subsequently to new structures.

The programme directors decided to commission the evaluation on the programme objectives to two independent, renowned bodies to increase credibility and accountability. In previous large scale infrastructure projects such as the Betuwe Rail Freight Route the project objectives were continuously questioned (Hertogh et al., 2008). Deltares, a research institute, did the flood modelling for the entire river basin and evaluated the potential decrease of water levels of river widening measures. An independent expert panel on spatial quality was installed, the Quality-team or Q-team, to evaluate and safeguard the programme's overall objective on spatial quality. As a member of the Q-team stated: "we should not allow students to mark their own homework".

The concept of more regional leadership has been operationalized, by calling for regional and local stakeholders to propose measures themselves. Often a regional authority was requested to lead the planning process for the measure the authority had proposed or selected itself. The selection of 39 measures out of a long list of 600 was done by two committees comprising political representatives of regional and local authorities. They used the computerized hydraulic model/scenario planning tool called

‘box of blocks’. The tool was made available to all stakeholders to ‘play with’ and could demonstrate and visualise the effectiveness and interdependencies of measures to reduce water levels. Hence the tool provided a vehicle for regional stakeholder to propose their projects and it gave transparency on the need of the Room for the River programme and of its individual measures. According to interviewees from the National Ministry: “the box of blocks was a crucial element for effective collaboration between authorities.”

Dutch Government assigned the implementation of the Programme to the Programme Directorate Room for the River (PDR) that would serve as an interface between national and regional governments and could safeguard strict programme controlling and management. Regional authorities justified progress on their project to the PDR. In turn, the PDR had to justify progress of the Programme every 6 months to Dutch Government and Parliament for which it monitored the progress, scope and quality of the 39 projects. Important lessons on management structures were learnt from the Meusse Works, a river widening project that predated RftR. Its monitoring system was furthered and organised around decision-making milestones set by the Programme Directorate. It prescribes the level of detail and corresponding quality of documentation required for a decision making phase. Some examples: referential calculations of decreased water levels, initial designs of dykes with related cost estimations, initial spatial designs, reports on fit with regional and national policies, overview of legal issues such as permits required and status thereof. The Programme Directorate was deliberately staffed with professionals with experience from previous Large Public Works projects. For the Knowledge Department notably from Meusse Works and for Project Controlling from the High Speed Rail project. Lessons from RftR on new project controlling approaches have been adopted at Rijkswaterstaat and other partner organisations according to 114 of 141 respondents. Also the survey results indicate that Room for the River has had much influence on the (future) application of programme directorates (3.86/5). A senior government official confirmed that: “the Delta-Programme is currently considering the creation of Programme Directorates, following the example of Room for the River”. Especially strict management

## **Practices**

During the initiation phase of RftR ‘working and learning together’ was especially centred around the box of blocks. Schut et al. (2010) explain how the instrument evolved from first a tool used by hydraulic engineers (also Reuber et al, 2005) to ‘explore solution space’ and calculate the hydraulic consequences of a combination of (river widening) measures, to later supporting the design and selection of measures, facilitating dialogue, cooperation and eventually decision-making between policy makers from different levels and regions. Hence, the tool connected the social learning activities: system analysis; collaborative design, planning and engineering; and governance (Van Herk et al., 2012a). Stakeholders learnt what type of measures were possible to reduce water levels and what other amenities they could offer. Especially regional stakeholders saw opportunities to combine nature, recreational, industrial or urban development. Their enthusiasm for these adjacent policy objectives reinforced the idea of the programme objective ‘spatial quality’. The interests, resources and mandates of different authorities became apparent and was useful input to request leadership to certain stakeholders for individual projects. A project manager from Rijkswaterstaat stated that: in involving the competent stakeholders we learnt much from the Maasvlakte project that extended the harbour area of Rotterdam seawards, to involve in an early stage those authorities responsible for planning and operation and maintenance”.

## **4.2 design phase 2006-2011, learning to adjust governance arrangements**

### ***Interpretations***

During the design phase integration of flood risk management and spatial planning was further anchored as examples of integrated projects emerged. Examples abound. The design of a river by-pass at Lent created an island and included waterfront developments with recreational functions proposed by the municipality and inhabitants and nature development proposed by the regional government. Additional funding sources have been explored and used from different policy domains. For Lent it was decided to lengthen the river by-pass to connect the river widening measure to a nature development project funded by the regional government. However, the design approach was not always inherently integrated. Following mandatory procedures for

environmental impact assessment, the PDR set the requirement to at least present 3 alternatives. One alternative had to be the 'safest', another with the highest 'spatial quality' or 'regional support', and finally a 'lowest cost' alternative. Exploring these extreme alternatives tended to separate the objectives of safety and spatial quality that became viewed as opposites in terms of solutions. Eventually, elements of the extreme alternatives were incorporated in the preferred alternative, but required negotiations on investments.

The interpretations of the spatial quality objective changed over time. Instead of presenting river widening as an opportunity for delivering spatial quality and to incentivise regional stakeholders, this objective was seen as a luxury. The political landscape changed significantly after the 2010 national and local elections. Political support for spatial quality decreased, in particular budgets for nature development and recreational development, whilst agriculture as economic activity gained relevance. Representatives of the Programme Directorate explicitly highlighted that a programme with a long duration needs to be able to adapt to changing context and be flexible. A respondent responsible for communication explained that the programme no longer used the word 'nature' in communication and focused on flood safety and agriculture. Moreover, solutions were sought to preserve or develop farmland. E.g. in the Veessen-Wapenveld project where a by-pass is proposed through farmland, stakeholders decided to acquire additional agricultural land outside the area to compensate nature development in the river IJssel by-pass.

The advantages and pitfalls of a programmed approach, 39 projects within on programme, became apparent and lessons for governance were incorporated. Firstly, the programme's success depended on the success of its individual projects: "RftR is like a chain of pearls: beautiful individual projects that cannot be considered in isolation of each other." Each individual measure is necessary to reach the overall objective to increase river discharge capacity and lower water levels along the river basin. Also, the satisfaction or dissatisfaction amongst stakeholders in one project could affect other projects. Hence, the PDR continuously emphasised to regional stakeholders the importance of their project to achieve the overall programme objectives and thus the flood safety of the Netherlands. Secondly, projects could learn from each other and create peer pressure amongst them that stimulated progress and quality. E.g. lessons

ranging as broad as real estate purchasing, soil movement, and expectation management towards inhabitants were shared amongst project teams.

The paradigm of ‘controlled trust’ has been adjusted during the design phase. The PDR observed from its monitoring activities that many projects failed on many criteria and often due to similar issues. The PDR explicitly decided to pro-actively and constructively support projects. I.e. the monitoring led to a culture of collaboration as the PDR facilitated and supported the individual projects to comply with the criteria that were monitored. The justification cycle as described by Rijke et al. (2012b) was introduced and ‘facilitation’ was added to ‘monitoring’ and ‘justification’.

### ***Structures***

“We have continuously adapted and improved the organizational structures and processes based on lessons learnt and whenever opportune. The PDR started as a local train and whilst driving we converted it into a high speed train”, a Management Team member of PDR explicitly highlighted. Many examples have been found during the research. The Programme Directorate was organized in three separate departments: knowledge, project controlling and stakeholder management, that have changed their processes to work more closely together to support individual projects. Stakeholder managers were the ‘front office’ for projects towards the PDR and were the first to observe problems. However, many challenges were not merely political, but related to specific disciplines from the Knowledge department (eg soil quality, piping and cabling, hydraulics) or Project controlling (budgeting, contracting). Hence, so-called triangle meetings were organised between the 3 departments and the front-office for each individual project was extended with an expert from Knowledge and Project Controlling. Progress and risk management reports were introduced and discussed with criteria from the different departments.

The Q-team became more instrumental to support individual projects in exploring and delivering spatial quality. The Q-team not only supported and promoted attractive spatial designs, but inherently considered project technical feasibility as the team comprised multiple disciplines: ecologist; hydrologist; morphologists; landscape architect; etc. They periodically visited projects and gave independent advise on project

designs and the design process. In Lent the municipality decided on the creation of a local Q-team and several projects contracted independent landscape architects that would work alongside the project manager. Hence, a combined example of changed interpretations, structures and practices related to a more collaborative relationship between regional projects and the national programme.

Many lessons related to the programmed approach were adopted in terms of 'structures'. The positive features of learning and peer pressure between projects were exploited by e.g.: explicitly naming frontrunner projects, organising personnel exchange, and by organising network and training events for project leaders, stakeholder managers, contract managers, politicians. This learning approach was also applied for the project that comprised the lowering of approximately 500 groynes along the Waal river. The project was organised in 3 tranches to learn from previous tranches in terms of e.g.: hydraulic, morphologic and ecologic effects; construction time; market approach. This learning in terms of 'structures' also led to many lessons in 'practices'. After the first tranche, based on stakeholder feedback and new insights, groyne designs were adapted with decreasing heights towards the river instead of flat groynes; and small beaches and fish breeding grounds situated around groynes were preserved.

### ***Practices***

In a programme of the sheer volume of Room for the River in terms of budget and involved individuals, and considering its innovative nature, many examples of learning in terms of 'practices' have been found (see Van Herk et al., 2012b for an elaborate overview). Here their use to adjust governance arrangements is exemplified. Van Herk et al. (2012b) describe how many lessons on work approaches have been disseminated beyond the project or programme through e.g. guidelines for a specific policy domain or disciplines. Room for the River has actively contributed to guidelines for: soil movement planning; planning for spatial quality; groynes information systems; consistent information requirements for hydraulic, vegetation, landscape mapping and planning; and asset monitoring and maintenance protocols. As explained above, from the monitoring activities recurring issues in different projects became apparent. These were addressed by specific task forces to benefit an individual project and other projects within RftR through these guidelines and pro-active facilitation by experts from the PDR. Many of these lessons have been converted into training programmes or have



been addressed in thematic network events organised for the Room for the River community. Another group of lessons from individual projects have been adopted in policies that have taken effect during Room for the River and influenced other projects, such as: policy for land use in outer marches; precedents for dyke requirements; regulation on soil and water quality; regulation for redevelopment of lakes; and nature-oriented planning.

All projects have changed their management structures to a unified approach throughout the programme. On the level of project teams, the Integrated Project Management approach was introduced after which every project team comprised the roles of: a project manager, technical manager, stakeholder manager, legal manager. This improved the quality of facilitation from the PDR to regional projects and further stimulated the exchange of lessons between projects and their team members. These lessons and governance arrangements have an enduring effect beyond RfR. Survey results show that RfR contributed significantly to the design of project teams: 3.64/5.

The interface between planning phases was also carefully managed. On a project level the responsibility shifts from the 'initiator', often planning authority such as the municipality or province, to the 'executant' often a waterboard or regional office of Rijkswaterstaat that manage the delivery and future operation and maintenance of the projects. Project teams and politicians have been preparing for their new role. They would function in parallel with their predecessors during a period of six months to one year. The Programme Directorate named this deliberate strategy: 'hot joint'. Also, different competences are needed in the project team when projects were transitioning towards the delivery phase. A shortcoming of required expertise (e.g. market approach, tendering, logistics, litigation) was identified and training and personnel shifts were organised. For example, the project team for the Noordwaard project, a frontrunner project that had already entered the delivery phase, will also work on another project Ruimte voor de Lek. Especially because experience and knowledge of the team on contracting, construction, permits is deemed useful. Ruimte voor de Lek has a more complex stakeholder configuration that in turn is a learning opportunity for the Project Team. Nevertheless, not all is positive. Interviewees of both the PDR as from regional projects indicate that the PDR itself is lacking in its own interface management and might not be adequately staffed in these early stages of the delivery phase.

The monitoring by the PDR has been converted into a collaborative activity with regional stakeholders dubbed 'fraternal monitoring', rather than imposed top-down from the PDR. Some monitoring and tests depending on the type of related risk can be performed by the regional stakeholders themselves or commissioned by regional stakeholders to private engineering and consultancy firms. Regional stakeholders, notably the Waterboards, requested this to increase their own learning experience. It was brought forward out of their 'improvement programmes' following national political discussions on their own future existence. Also, Rijke et al. (subm) show that the administrative burden of monitoring and reporting was considered high and stakeholders suggested a re-think of the processes.

It was observed that permit requests could hamper the progress of projects. A variety of authorities are responsible for granting permits such as: nature permits, building permit, transport permits, etc. The PDR requested authorities to set up working groups on permits, litigation and execution, amongst other things to coordinate and combine permit requests to the different authorities, to plan execution to minimise costs and nuisance and for communication with inhabitants that are affected especially during the delivery phase. Politicians from the steering committees and civil servants from the project teams tried to streamline permit requests amongst different authorities and interacted with their independent permit departments. Firstly this was beneficial as all permits were obtained in one go, instead of going through multiple formal procedures. Secondly, because conflicting interests might result in execution plans receiving a permit on one issue, but being rejected on another issue, possibly delaying the whole project. The interaction in the working groups increased understanding of mutual interests and supported looking for integrated solutions. An example was given that one authority would ideally have construction planned at night to reduce traffic nuisance, whereas for ecological reasons work at night was not recommended. The contractor could discuss this with all authorities involved. In all cases project designs and execution plans were tested to be litigation proof, to avoid losing a lawsuit that could delay the project.

## 5. Discussion

The results show many examples of different types of learning outcomes and how these have contributed to the design and adjustments of governance arrangements. Organisational structures and processes were adapted to ‘absorb’ the effects of a changing context and incorporate lessons that benefited a successful delivery of the Programme and thus of integrated adaptive flood risk management in practice.

The different types of learning outcomes in RftR have been mutually enforcing. Lessons in terms of ‘interpretations’ have influenced governance arrangements and subsequently lessons in ‘structures’, that contributed to cognitive and behavioural learning outcomes in ‘practices’. For example the new concepts of river widening and integration of flood risk management and spatial planning, required collaborative arrangements between national government and regional stakeholders: political and financial agreements were signed for planning and realisation and national experts facilitated regional integrated design processes. The Programme Director appositely explained the rationale behind his decisions on governance arrangements as: “structure should follow strategy”. Hence a practical example of the fit-for-purpose theory as proposed by Rijke et al. (2012a). In practice, many innovative solutions were developed for river widening and related delivery of e.g. nature or urban development leading to capacity building amongst involved individuals (Van Herk et al., 2012b) of which many lessons have been documented in guidelines. Vice versa, learning in terms of practices have influenced structures and both have contributed to learning as ‘interpretations’. E.g., when the monitoring results of the PDR indicated that many projects faced problems, the philosophy of ‘controlled trust’ was amended to a more collaborative approach and new organisational structures and processes were designed for facilitation of individual projects. The Programme Decision as adopted by Dutch Parliament in 2006 was strict in objectives and scope, but was flexible in structures and enabled such changes. Hence we observe feedback loops between the learning outcomes as presented in Figure 1. Knight and Pye (2004) did not describe these interdependences, but Armitage et al. (2008) concluded that it is difficult to distinguish different types of learning what can be explained by these feedback loops.

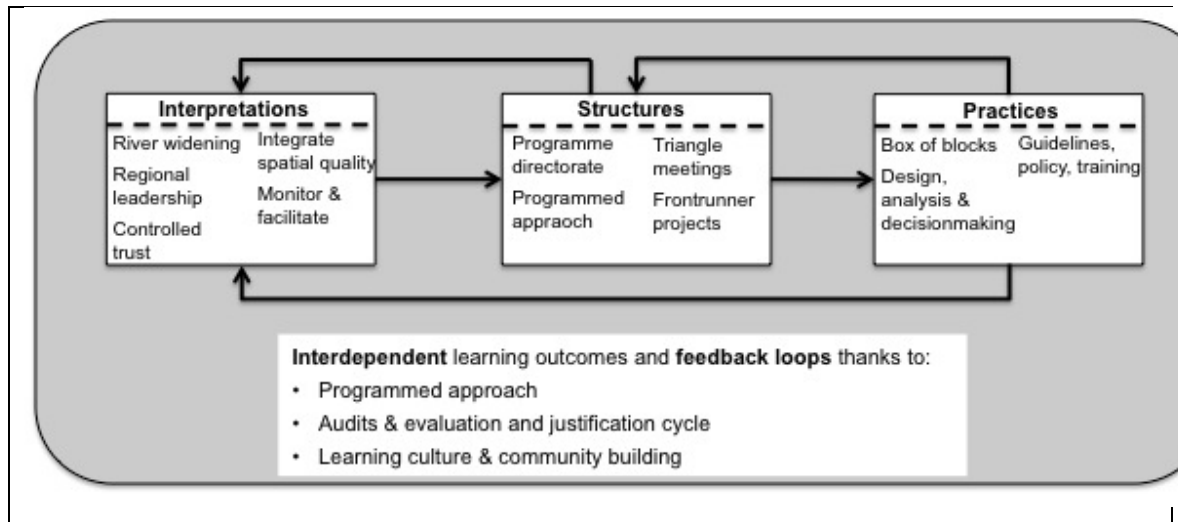


Figure 1: interdependent learning outcomes and feedback loops

The research found specific governance arrangements that supported the generation of learning outcomes and their mutual reinforcement. Firstly, the culture of transparency and accountability was operationalised in a wide range of audits, evaluations and monitoring assessments from which many lessons were drawn. Dutch parliament required 6 monthly audits and the PDR monitored projects. The Ministry and the PDR commissioned external evaluations on spatial quality (Hulsker et al., 2011), hydraulic performance, and governance (Ten Heuvelhof et al., 2007; Van Twist et al, 2011). In fact, the management of PDR commissioned the scientific evaluation of which intermediate findings are presented in this paper. Secondly, the PDR deliberately created culture of learning and a ‘community’ of involved professionals and politicians for exchange of lessons. Lessons, negative and positive, were to be documented and shared at network and training events for different target groups. Diduck et al. (2005) described that learning is supported by an organisational frameworks that are characterized by trust-building efforts, a transparency to test and challenge embedded values and active and broad public participation. Thirdly, the programmed approach and programme directorate enabled the upscaling of lessons and sharing of lessons between projects. It is hard to classify these learning mechanisms in the approaches listed by Cook et al. (2004) as this depends on the scale level of analysis. Learning at a Programme level can be considered ‘Adaptive Management’ as it has been a ‘learning by doing’ process, at least partly ‘directed at policy and management modification’. The experimentation and replication of lessons within and between different individual

projects can be classified as ‘Adaptive experimentation’. This research has not found a new type of learning mechanisms, but existing theories can be enriched by the examples from Room for the River.

The results of this research also provide elements to enrich the emerging theories related to learning loop typologies and adaptive governance. We suggest to include the learning on organisational structures and processes and their subsequent incremental adjustments as a part of single loop learning. In doing so, the enriched theory can also explain the contribution of single loop learning to double loop and triple loop learning. Pahl-Wostl (2009) conceptualised change as social and societal learning that proceed in a stepwise fashion from moving from single to double to triple-loop learning. This is observed in Room for the River, especially during the design phase, as cognitive lessons on integrated flood risk management and spatial planning is leading to a reframing of problems and values and is pushing more structural changes to the regime’s institutions and policies (see also Huntjens et al., 2011 and Van Herk et al. 2012b). The Dutch Delta Programme, a new regime level programme, has further institutionalised lessons from Room for the River (e.g. Van Herk et al, 2012b). However, the case study presented in this paper also presents evidence of an influence in the other direction, particularly during the initiation phase. From the outset the programme was created based on new paradigms in flood risk management, participatory planning and programme management. The multi-level-governance approach can be classified as a fundamental change at regime level that provoked a rethink of guiding assumptions (double loop) and catalysed a range of single loop learning outcomes in terms of actions and governance arrangements within and during the programme. The researchers expect this same pattern to occur during the Delta Programme as that additionally incorporates a new paradigm shift regarding the integration of fresh water supply and flood safety objectives on a national level (Deltacommissie, 2008). The two-way cyclical contributions of different types of ‘loop learning’ is graphically represented in Figure 2. This insight could be particularly valuable to adaptive governance theory as the adaptation of our socio-ecological systems will take place through policy and investment programmes and projects.

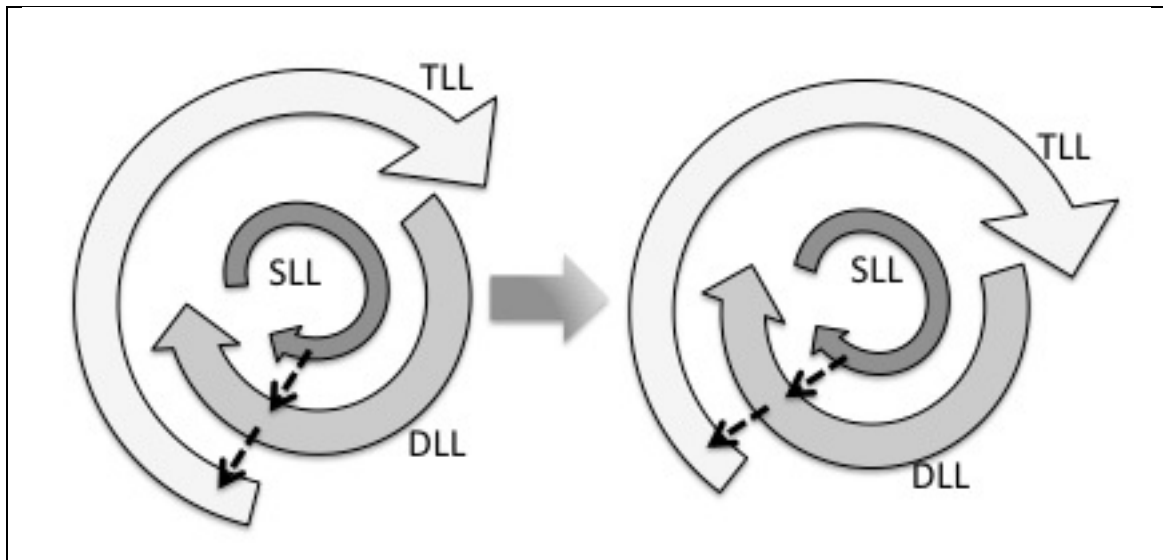


Figure 2: two-way cyclical contributions of different types of loop learning, if changing governance arrangements within a programme are included in the definition of single loop learning.

## 6. Conclusions

This paper provides insight in how learning can contribute to the design and adjustment of governance arrangements to deliver integrated and adaptive flood risk management in practice. The learning outcomes can be classified in terms of ‘interpretations’, ‘structures’ and ‘practices’ that mutually reinforce each other through feedback loops. Additionally evidence from the case study Room for the River is presented on governance arrangements that support these learning mechanisms.

The emerging scholarship of adaptive governance can be enriched by including the concept of learning that contributes to the design and adjustment governance arrangements. These arrangements are to be evaluated and revised continuously to be fit for purpose. Both to deliver adaptive integrated flood risk management in practice through policy and investment programmes and projects, and to contribute to a transition that gradually changes the regime to become more apposite for integrated and adaptive approaches.

The concept of adapting governance arrangements through learning is new in both adaptive governance literature as well as programme management literature. More case study analysis and case comparison is necessary to further and to integrate different theories. Armitage et al. (2008, p97) concluded that: “Attention to learning as an

explicit strategy in the design and operation of co-management is only just emerging. There is little experience upon which to base the development of best practices, or critically assess the process of learning in adaptive co-management. Thus, an important task is to identify and consistently evaluate those instances where learning (as a learning-by-doing process or through ‘controlled’ adaptive experimentation) is an explicit concern, to identify what works and what does not, and to elucidate key lessons and helpful models for future governance innovation.” We call for evaluations that are conducted during policy programmes and aim to actively contribute to the governance of these programmes. Just as the Q-team of Room for the River monitored, documented and directly applied lessons to increase spatial quality, a Governance-team could do the same related to lessons to continuously amend fit-for-purpose governance arrangements.

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