The next step in policy transitions: Diffusion of pilot projects

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Abstract

Pilot projects are policy instruments applicable for many types of purposes. Pilot projects are mainly applied to introduce or test new practices, ideas or technologies. Among the benefits and impacts of pilot projects, we found the change in perceptions and practices at local levels and notably, social learning. When pilot projects are proved effective, they can be diffused and lead to a broader policy transition. However, there is little evidence on both the content factors of the pilot projects and on the process of pilot's diffusion. The research objective of our paper is to investigate the nature of diffusion focusing on the subjects of diffusion (namely the artefacts, ideas and concepts and institutional designs) and on the pathways of diffusion (namely dissemination, organic and transposing scaling up). The developed framework of pilot project diffusion is illustrated in four case studies in water management where insights in the functioning of these pilot projects and their contribution to diffusion of the innovation are also revealed.

Keywords: pilots, policy transitions, water management, governance, dissemination, scale.

1. Introduction

Pilot projects are often used in policy and management contexts to apply and adapt an innovation to a real-world situation (Lee, 1999). Pilot projects are seen as means to test the innovations and to develop knowledge about the interactions of the innovation and the context that consequently allows innovations to mature (Lee, 1999; Raven 2007). In addition, pilot projects are particularly considered as means to deal with the complexity of socio-ecological systems (Olsson et al., 2004; Dehnhardt and Petschow, 2008, Ker Rault 2008), enhance communication across actors and domains, to set the agenda and to streamline resources (Pahl-Wostl, 2006, Pawson and Tilley, 1997). Social and policy learning are realized within the pilot projects.

Social learning as one outcome of pilot project implementation has a number of benefits for the social system. For example, change of practices and perceptions is a desirable and feasible outcome of successful pilot projects. The pilot projects then function as what Van Sandick and Weterings (2008) describe as 'the stepping stones for societal change'. In the same vein, pilot projects are seen in transition management as instruments that have the potential to stimulate perceptions' change that can build up into co-evolving processes of social change or transitions (Loorbach, 2007; Frantzeskaki et al. 2008; van den Bosch and Rotmans, 2008). Pilot projects can therefore be designed to serve multiple functions in policy making and transition management, that makes them an attractive instrument for diverse social problems and contexts.

When a pilot project meets the policy goals and benefits society, it is considered a success. Successful pilots are often desired to be expanded or continued, that is referred to as "diffusion" of the pilot. Follow-up of the pilot design can be organized, spread of the ideas or embedding of the ideas in the policy context can also be realized. Pilot projects have been designed and applied in a number of policy domains such as health care (Baumgartner and Jones, 2002), social policies (Greenberg and Shroder, 2004) or mobility (Hoogma et al.,

2002). Particularly in water management domain, pilot projects are important means to both policy makers and scientists. Water management will be facing increasing challenges given developments such as globalization, climate change and increasing water demands. These ask for new approaches that are first to be tested on a small scale to prevent larger policy flaws and second, are designed to allow the system for remaining adaptable (Pahl-Wostl, 2006; Pawson and Tilley, 1997).

Despite these promising contributions of pilot projects, the actual impact to policy development however, is often limited and constitutes no more than 'learning from failure' (de Groen et al 2004, Sanderson, 2002, Raven, 2007, Bennett and Howlett, 1992). The nature, direction, extent and conditions of diffusion are little understood since pilot projects are, despite their wide use, rarely studied in depth. The research objective of this paper is therefore to understand the diffusion process of pilot projects. More specifically, the subjects of diffusion, the diffusion process and the pilot project itself, the different patterns of diffusion process and the relation between the nature of the pilot and the outcomes of the implementation process are researched and analyzed using both theory and case studies methods. The understanding of diffusion provides policy developers with insights to further develop strategies for successful diffusion of pilot projects that can contribute to broader societal changes such as transitions. We develop a framework on pilot projects that conceptualizes the nature and process of pilot projects (section 3) and diffusion processes (section 4). The framework will be used for analyzing four water management case studies the Rhine Basin and South Africa (section 5). Additionally, the case studies provide insight in dynamics of the pilot projects that have contributed to diffusion, hurdles that have been encountered and potential strategies to deal with these. In section 6, a comparative analysis of the four pilot cases reveals the applicability and usefulness of the framework as well as the side-effects of the pilots for policy transitions. The paper finishes with recommendations for policy-makers and researchers and conclusions in section 7.

2. Methodology

The study consists of two major steps. The first step is the development of a framework that describes the nature of pilot projects and the nature, extent and direction of diffusion. The second step is its application in four case studies. The case studies include three floodplain management projects in the Rhine Basin (Beuningen in the Netherlands, Altenheim in Germany and Basel in Switzerland) and an integrated coastal zone management project in Saldanha Bay, South Africa.

The development of the framework has been based on literature study, drawing from fields such as innovation studies (Rogers, 2003), evaluation (Sanderson 2002, Martin and Sanderson 1999, Campbell 1975, Pawson and Tilley 1997), transition management and adaptive management (e.g. Rotmans 2003, Hoogma et al 2002, Pahl-Wostl 2006, Gunderson 1999, Lee 1999). The use of the framework in the cases enables the identification of patterns of diffusion. Additionally, explanatory mechanisms and encountered hurdles can be identified. Case study research in general can be useful in developing context-dependent knowledge and as such contribute to the body of knowledge on pilot projects and diffusion (Flyvbjerg 2006). The cases have been selected since they all derive from the water management field, deal with conceptual innovations in management approaches, but show different diffusion trajectories. Data on the case studies have been derived from grey literature (all), secondary data (Basel, Saldanha Bay), interviews (Beuningen, Altenheim, Basel) and active participation by one of the authors (Beuningen, Saldanha Bay). Interviews have been conducted in 2004 (Beuningen), 2007 (Altenheim) and 2008 (Basel). Interviewees included project participants from ministries, government agencies, research institutes and local universities, stakeholders and NGOs. The experiences of the interviewees in combination with the project documentation gave insight in the development of the projects and how they viewed them. Additionally, the functioning within the broader water management process and encountered

hurdles to diffuse the projects have been discussed. The interviews have been reported and send to the interviewees to provide the opportunity to check these.

3. Nature of pilot projects

To understand the role pilot projects can play in water policy transitions, we have to find out about the nature of pilot projects. This includes the characteristics of pilots, how pilot projects are designed, what types of effects they can have and how they interact with their context. We therefore introduce a framework that describes the nature of pilot projects, namely what their design characteristics are and how they function as policy designs.

3.1 Characteristics of pilot projects

Pilot projects are widely present in water management even though formal descriptions of the construct are lacking. Practitioners and citizens involved in the pilot, first attribute innovation, testing and small scale to pilot projects. However, the study from Vreugdenhil et al. (2009, forthcoming) reveals that pilot projects show a wide variety in the design (e.g. variety of the level and type of innovation, types of actors are involved, scheduling of involvement) and a broad scope or purpose.

Shared characteristics of pilot projects include their application in the field (in contrast to laboratory experiments or desk research) and the 'spirit of experimentation' (Weiss, 1975) (in contrast to 'normal' management projects). In addition to these shared characteristics, nine characteristics can be identified that vary in presence and nature across pilot projects. Every pilot has different 'values' for every one of these characteristics that makes every pilot project a custom-made design for the policy domain for which is applied.
The characteristics include:

(i) scale (e.g. spatial, temporal or problem scope)
(ii) level of innovation (that can range from incremental to radical in comparison to dominant practices)
(iii) substance of the pilot (e.g. institutional design or artefact or management approach)
(iv) relation to the policy (e.g. functions in the periphery of the broad policy domain or as part of the core of policy design)
(v) actor involvement (referring to the types of actors who are included, e.g. experts or multi-actor involvement)
(vi) knowledge-development orientation (e.g developing knowledge or transferring knowledge)
(vii) 'particularities' resulting from attitude towards the project, (given its previous characteristics, pilot project tends to function in a context of increased awareness and have a 'special status', resulting in 'special treatments' such as social attention, participation and resources availability)
(viii) boundary conditions between the pilot and its context (e.g. exporting boundary conditions where innovation is internally/ independently developed and can be transferred to the context versus interactive boundary conditions where innovation is co-developed between the pilot and its context).
(ix) use (pilots can be initiated for multiple purposes, including managerial, knowledge and political-entrepreneurial reasons)

In our research, we conceptualize pilot projects as an umbrella term for projects that are undertaken in the 'spirit of experimentation' in a field setting. This means they are build around the application of an innovation and can be differentiated from 'normal' management projects, desk research and laboratory experiments and thus have some special status,

resulting in 'different than normal' attitudes and possibly treatments. Their flexible nature makes them applicable for different situations; but at the same time, this flexibility in their nature and functionality can be misinterpreted by participants and observers, raising false expectations.

3.2 Pilot design process

Among the different types of knowledge development tools -such as mathematical modelling or laboratory experiments- pilot projects are distinctive in the fact that they are undertaken in the real world. This means that there is always an interaction of pilots with the context. Context includes the biophysical and institutional components. The biophysical context consists of factors such as the water system and infrastructures; the institutional context consists of factors such as rules or policies or organizations, while the norms and values (North, 1990) refer to for instance problem perceptions and attitudes.

Across pilot projects the importance of the different contextual elements can vary. For instance, in a pilot project in the Netherlands where dike strengthening techniques have been tested, the biophysical component was strongly present, while the institutional context was very weak; since the focus was on the technology itself, rather than its function in society. In contrast, in a pilot on dike transformations for coastal defence purposes, broad discussions on dike uses for and with the local community have been combined with the exploration of achieving flood defence levels (see also the pilot project reports of the Dutch Ministry of Transport and Public Works and Water Management, www.waterinnovatiebron.nl).

The water management context cannot only be described in terms of several factors, but changes over time. This is can be expressed generically in policy beliefs (Sabatier 1988), which is more specifically expressed in policies, management projects and pilot projects. The pilot projects can thereby be conducted far off from the policy, in the periphery, or in line with the policy. The latter increases the chance of wider recognition; while the first allows for more creativity (de Groen et al., 2004). Potentially, the pilot projects can influence other management projects or policies when they recognized to contribute to policies and practices. A wide recognition of (the function of) a pilot project is however limited in reality. According to Raven (2007) interconnections with policy development are often lacking.

Additionally, the pilot projects themselves change throughout their development. Different phases of the pilot project can be identified, including the initiation, design, intervention and effectuation between which different activities and dynamics take place (see Figure 1). The view of pilot projects as a process enables to relate activities and dynamics in early stages of the pilot project to later developments. Additionally, it shows that the interaction with the context is inherently part of the pilot, but that the nature of the context can change.

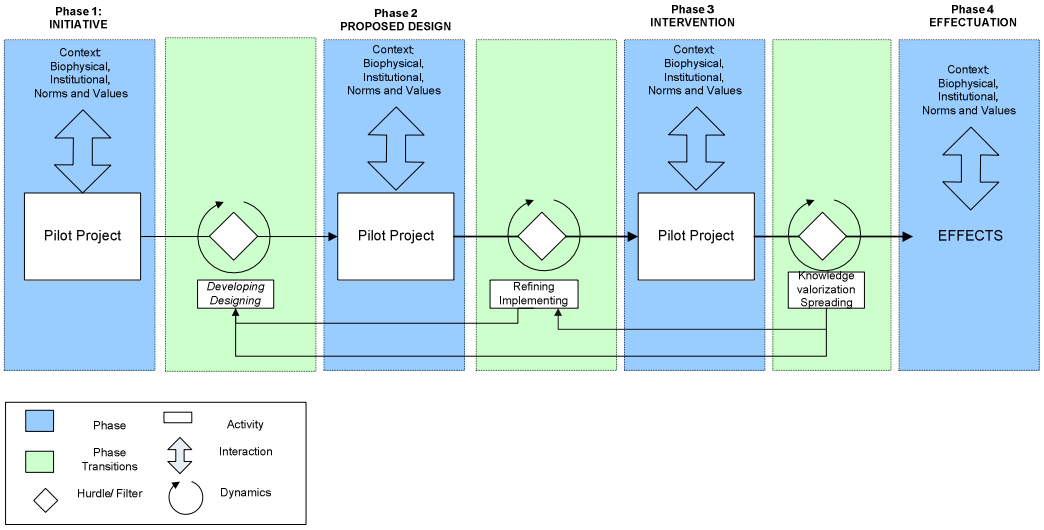

Figure 1. The development of a pilot project.

The model starts from the idea that an initiative has been taken to start a pilot project. The reasons to do so include both content- and process elements. Around the initiative, an actor-network is formed. The initiators, and depending on the actor-network structure other actors as well, further develop the innovation where considered needed, the pilot project is further designed, goals are expressed and the pilot positioned in the policy and institutional context. During these developing and designing activities, both analytical and political activities, such as modelling and negotiating, are undertaken. These activities lead to the second phase; the proposed design for the intervention to be taken. The proposed design can contain content and process elements. Here the translation from the drawing table to the field takes place.

Possibly different people (i.e. implementers) are involved who have again different expertise and perceptions, while all sorts of practical issues are encountered. The phase the pilot has entered now is where the intervention has been undertaken. The innovation has been installed and the subject (e.g. area, people) has been treated. This intervention phase is what is often considered as the pilot project since it deals with the 'real' action. Due to dynamics inherent to biophysical and societal systems, the system starts to respond. The types of responses can be broad, depending on the intervention, present elements and systems functioning and can include changes in for instance ecology, infrastructures and actor-networks. The earlier developed and possibly already adjusted knowledge management activities and diffusion activities are undertaken here. The intervention and the systems responses are monitored, whereby problem perceptions and focus on knowledge and innovation carry-over, and project characteristics such as budget and time availability influence the presence, nature and quality of the monitoring activities. The processed information is analysed, evaluated and interpreted, part of which is presented as explicated knowledge in written and oral forms. The knowledge valorisation activities are not necessarily formalized, but also include random observations and associated discussions to interpret these. In the last phase the pilot project has established effects. This represents the outcomes of the pilot.

Three categories of effects have been identified. The first is the systems response, both the biophysical and actor-networks and the development of the innovation. Second, the level of knowledge and learning has increased in different forms and for different people participating in the project or who learn about it. Third, changes have been established in the nature and process of decision-making, and the innovation or knowledge about it has been diffused to other pilots, projects and policies. To understand the functioning of the pilot, its context needs to be understood since they are intertwined. Their interactions guide, stimulate and hinder developments of the pilot. The nature of the context exists of biophysical and institutional

elements and norms and values, but also more generic elements such as demography and economy. An elaboration of the diverse effects of pilot projects is given in the following section.

3.3 Effects of pilot projects

Pilot projects can assort different types of effects. The three categories of effects (direct response, knowledge development and diffusion) are interdependent, meaning that one effect often influences the establishment of other effects. Thus, even though the focus of this paper is on the diffusion, an analysis of the effectuation of a pilot project has to address all the different effects to grasp a pilot's impact on the context. In section 4 we go into more detail into diffusion.

The realization of a pilot project influences the biophysical and the institutional context in different ways given the interaction with its context; albeit it may inhibit direct impacts on its context. For example, a pilot project can change the actor-network or the spatial feature of the pilot site. Particularly those pilot projects that deal with complex societal issues, where different disciplines and interests meet, are often developed by project teams with different actors (Van den Bosch and Rotmans, 2008) influencing in this way the actor-networks of the respective policy domain. More specifically, the interactions taking place within the project team can already impact the perceptions of actors, relationships and the information available for the project. Additionally, when implementing the pilot project or starting participation processes with external actors, the project will among others affect certain interests, increase knowledge availability across the different actors within and outside the project team, and change the structure of the actor-network.

Pilot projects are often claimed to be undertaken for the purpose of knowledge development /valorisation and learning (Vreugdenhil et al, 2009 forthcoming). The way the knowledge-carrier pilot is designed varies and influences the type of knowledge extracted, as well as the modes and levels of learning of different actors. In the pilot, knowledge can among others be developed about the innovation, used methods, the context and the interaction between these. Flyvbjerg (2006) argues that case studies are particularly valuable for delivering context-dependent knowledge. A similar argumentation could be used for pilot projects.

Knowledge valorisation includes different activities, one of which is monitoring. Monitoring plays an important role to collect data and to detect surprises (Lee, 1999). After analysis and interpretation, the knowledge can be actively and passively spread amongst direct project team members, the organisations they represent, and external actors. The different ways for spreading knowledge within the pilot include formalized reports, field trips and dynamics of people starting to work for different projects. Learning not only occurs in formal ways, but also through experiencing examples (Flyvbjerg 2001) and social interactions (Leeuwis 2003; Healey, 2006, p.156-158). People that previously did not know about each others perception and their interests; they may now take notice of this knowledge and possibly start to understand others' way of reasoning. Transferring local knowledge to policy makers contributes to decisions that are adaptive to the local context and reflexive to societal needs (Scott, 1998; Healey, 2006; Dryzek, 2005)

Consequently, the pilot projects can form the starting point for changed action. This can be done within the pilot project to improve the innovation itself or its application in the pilot site. Diffusion of innovation has been extensively described by Rogers (2003). He defined diffusion as the process by which the innovation is communicated through certain channels over time among the members of a social system. The adoption is the actual decision of an individual to use the innovation. Different forms of diffusion can take place, either actively or passively induced. The pilot project itself can be expanded in time and place and the

innovation or developed knowledge spread in new or existing projects and policies. An elaboration of the diffusion of pilot projects is included in the following section.

Pilot projects influence their context directly and indirectly. As we already presented, a pilot project can change the actor-network and/or the spatial feature of the pilot site, can contribute or aim at knowledge development /valorisation and stimulate changes in perceptions and practices.

4. Diffusion of pilot projects

A policy transition can be realized by diffusion of small scale innovations such as pilot projects. With diffusion we mean the broader application of (elements of) the innovation first applied in a pilot project. In contrast to other effects such as learning, diffusion in terms of increase in use is an implicit indicator of effect (Van Mierlo 2002). We thus take the pilot project as the starting point for internal changes in the initial pilot project and its innovation, the start of new pilot projects, adaptations in and start of management projects and adaptations in and start of new policies.

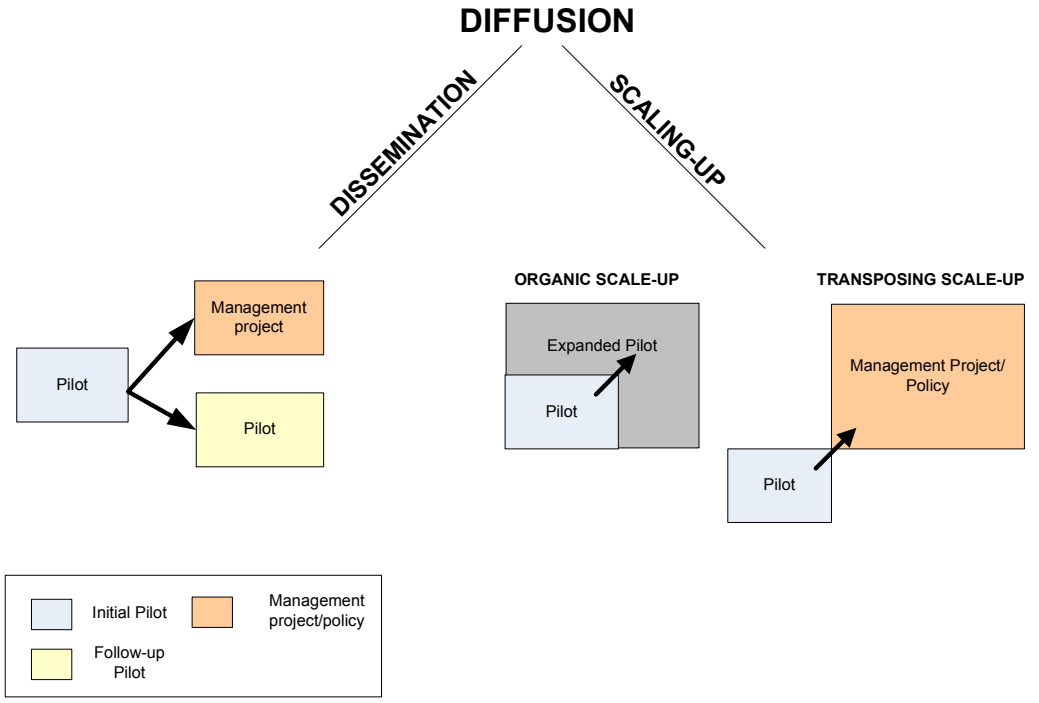

Figure 2. Diffusion of pilot projects through dissemination and/or scaling up.

Diffusion can take place in the form of dissemination and/or scaling up. Dissemination includes the replication or spread of the pilot project to other pilot projects or comparable management projects in other locations or times. The context thus changes, while the scales and accompanying type of issue addressed and level of complexity remain comparable. The stakeholder group also remains comparable (e.g. from farmer to farmer) (Douthwaite et al. 2003). This dissemination relates to what Van den Bosch and Rotmans (2008) conceptualize as broadening of experiments. Dissemination can also refer to dissemination of related knowledge that is for instance used within the pilot to improve the innovation. In contrast, scaling up refers to increasing the scale dimensions of the pilot project, whereby the qualitative and quantitative nature of the problem changes. Douthwaite et al. (2003) further refine scaling up by distinguishing between institutional expansion (e.g. from grassroots

organisations to key stakeholders such as policy makers) and widening the geographical scale of operation (e.g. from floodplain to river branch). Additionally, time horizons within the pilot or of new projects and policies can be expanded, while enhanced actor-network dynamics can cause to expand the problem scope. The dimensions along which the scale can change are therefore geography, time, institutions and problem scope. Subsequently, administrative boundaries expand, different biophysical processes start to play a role and new issues arise. Scaling up can take place through organic growth of the pilot whereby the pilot itself is enlarged, or through transposing the pilot to larger scale projects and policies (see Figure 2).

4.1 Subjects of pilot project diffusion

In addition to how diffusion occurs, we distinguish between what has been diffused. We have distinguished three elements of the pilot that can be diffused in a policy domain: the ideas and assumptions underlying the concepts, artefacts, and institutional designs. In this section, we present a grounding of these elements as subjects of diffusion in different theoretical frameworks. Our focus here is on theories that justify and elaborate on the subject of diffusion as means for policy change or societal change.

(a) Subject of diffusion: *Ideas or assumptions* (e.g. integration of domains)
Punctuated equilibrium theorists (Repetto, 2006, Baumgartner and Jones, 1993; 2002) note that an idea or policy issue can change the policy development in a domain when contextual factors create an environment of opportunity referred to as negative feedback cycles in policy domains. When the context allows for change, a policy issue or a new idea can enter the policy agenda and initiate the change. Policy change is gradual and evolves over periods of stability (or equilibrium) and instability as expressed by monetary or other policy indicators. What punctuated equilibrium theory however lacks is a specification of those contextual conditions that may favour the issue intrusion/incorporation and policy change.

(b) Subject of diffusion: *Artefact* (e.g. inflatable dike)
In innovation literature focussing on artefacts in commercial settings (e.g. Rogers 2003), diffusion of artefacts constitutes the mechanistic dissemination of these artefacts to different groups of users. In addition, in technology policy literature, strategic niche management has been developed as a framework for technology policy that nurtures innovation. In strategic niche management literature (Hoogma, et al, 2002), the subject of scale-up or introduction to the policy domain is a design as an artefact. The innovative design or the new technology is initially introduced and tested in a small-scale with favourable conditions, so as to assess its social accessibility and performance. The innovative design hence is firstly introduced in a niche. The transfer of the new design from the niche to the larger societal sphere is realized carefully and accompanied with a number of policies to protect it against competing designs. What strategic niche management offers to policy developers is a framework of policies to strategically scale-up the innovative design.

(c) Subject of diffusion: *Institutional arrangement* (e.g. permit system)
An institutional arrangement or design that is capable to either stimulate to favour or accommodate policy change can be a subject of diffusion across policy domains or across countries (Scott, 2001). Two prevailing theoretical frameworks support the idea for transplanting/diffusing institutional arrangements/designs across policy domains: the New Public Management governance started in early 1980s that supported the idea of managerialism in the public sector institutions (Kickert, 1997; Osborne and Gaebler, 1992) and the adaptive management framework (Lee, 1993; Paavola, 2007) that supported the idea of participatory policy making for environmental resources and the consequent institutional arrangements to perform and operate adaptive policy making. The often

present context-dependency of institutional designs requests contextualisation when considering diffusion (de Jong, Lalenis and Mamadouh, 2002).

In summary, diffusion concerns both *what* and *how* (elements of) the pilot projects have been diffused. What has been diffused can broadly be categorized into artefacts, ideas/ assumptions and institutional designs. How it has been diffused include dissemination and scaling up through organic growth and transposing of the pilot. Diffusion of the pilot and its associated knowledge can be recognized if it returns in for instance the innovation, new pilot projects, regulation, projects, policies and management plans. Less tangible, diffusion can also be recognized in ways of working or name awareness.

5. Examples of pilot projects in river restoration and coastal zone management

Summarizing and structuring the conceptualization of pilot projects leads to a framework that provides a lens to study the cases. Overall, the framework contributes to the understanding of the construct pilot project and their functioning within the case studies.

The starting point for analysis is the pilot project itself. First we identify the nature of the pilot project by assessing the type of pilot, its positioning in and interaction with its context and the achieved effects. Secondly, we identify trajectories and nature of diffusion. Pilot projects can be reinforced and influence policies directly or indirectly via management projects and can constitute dissemination and scaling up. We identify which elements of the pilot (e.g. the innovation, knowledge, assumption, design) have been diffused and how the diffusion changes the nature of the problem. Thirdly, we identify dynamics contributing to and hurdles for diffusion. In the following cases we will first describe the case studies and subsequently compare these with the help of the framework.

5.1 Pilot project at the floodplains of Beuningen: the introduction of Cyclic Floodplain Rejuvenation

The floodplains of Beuningen are located along the river Waal, a branch of the river Rhine in the Netherlands (see Figure 3). Abundant vegetation growth in the floodplains over the past two decades has reduced the discharge capacity of the river. To restore the flood defence levels the local environmental manager (Ark foundation) and the Radboud University Nijmegen developed the concept of 'Cyclic Floodplain Rejuvenation' (CFR). The idea is that in a restrained river like the Waal, forces are lacking that in a natural system would regularly rework sediments and set vegetation back to pioneer stages (Smits et al. 2000, Baptist et al. 2004). Within the concept these forces are imitated or enhanced and so to create more space for water and increase the diversity in vegetation. Examples of measures include resetting vegetation, excavating secondary channels and the use of half-wild naturally present grazers such as horses. In Beuningen, CFR has first been applied in a pilot project within the framework of the EU-Interreg IIIb project 'Freude am Fluss' (Peters et al. 2006). The pilot is undertaken in the policy periphery, but does cohere with the line of thinking present in policy programs such as 'space for the river' in the Netherlands.

Figure 3. Location of the floodplains of Beuningen/Ewijk along the Waal River in the Netherlands (sources: RWS-RIZA and Stichting Ark).

After the identification of the problem in 2004 a project team with representatives of Ark, the university, the river manager and operational arm of the ministry of Transport, Public Works and Water Management (Rijkswaterstaat-RWS) and State Forestry started the CFR development process to both resolve the issue and test CFR. In a formal setting the project team met approximately 4 times a year but most members knew each other quite well and discussed regularly in smaller settings. The Radboud University mainly operated as a facilitator and in close cooperation with ecologists, river engineers and operational managers designed several measures that were being discussed in the meetings and checked for feasibility and hydraulic effectiveness by Rijkswaterstaat. Additionally, yearly workshops have been organised with a broader group of people and a handbook that focuses on the principles of the concept and its meaning in practice has been written (Peters et al., 2006). Rijkswaterstaat mainly functioned as a 'quality control' and indicated boundaries such dike stability and expected morphological impact in the main channel, while Stichting Ark and State Forestry were more focused on the exact design characteristics as location within the floodplain and coherence with the ecological system, and practical considerations as costs, impacts for grazing and accessibility for visitors. In 2005 an intervention in the form of secondary channels has been decided upon (see Peters et al 2005), after which a process of obtaining permits (e.g. for vegetation removal, soil quality, spatial plans) and further refinements started.

In 2008 the first part of the implementation, vegetation removal, has been executed by a contractor. Excavation of the sand will take place in a later stage when this sand can be used for the construction of a near-by planned bridge, so the intervention at this stage is not yet complete. Formal monitoring programmes have not (yet) been developed, which indicates that the focus of knowledge development about the interaction of the concept with the biophysical context is limited and resolving of the local issue is dominant. Diffusion has taken place conceptually. An existing project in a nearby floodplain (Millingerwaard) also under management Ark, has been transformed into a second CFR pilot. The concept has also been included in a proposed program 'Waalweelde', developed by local stakeholders and the Radboud University, as a management approach for a number of floodplains. Implementation so far is limited however. In both cases of diffusion we can speak of dissemination since it deals with projects with comparable scales as Beuningen.

The case shows that the value of the pilot is in establishing cooperation between actors and positioning towards each other (e.g. who designs, decides or sets the conditions?).

Additionally, outcomes on the functioning of the concept are not very important. Rather, the pilot process has convinced actors about the assumptions underlying the concept and scepticism on the level of 'gardening' has been set aside, at least during the course of the pilot. Since it is undertaken as a pilot, people have changed their attitudes. For the diffusion it is important that the initiators are part of diffusion processes. Without these, so far diffusion has not occurred.

5.2 Pilot project at polder Altenheim: The introduction of Ecological Floods

Polder Altenheim is a floodplain area in the Rhine Basin in Baden-Wuerttemberg, Germany (see Figure 4). In this section of the Rhine, flood defence levels need to be restored to the level before dams were constructed for hydropower purposes. This was agreed upon in the treaty between France and Germany in 1982. The policy program 'Integrated Rhine Program' (IRP) has been developed to achieve this (Gewasserdirektion, 1997). It constitutes among others the use of disconnected floodplain areas as inundation polders. One of these is Polder Altenheim. The first use of the polder as a retention area in 1987 showed not only that the water level was too high – much higher than there would ever be in a 'natural' state - but also that species present in the area were not typical wetland species thus not used to floods. They had adapted to the new, relatively dry and stable conditions caused by the disconnection of the river since the construction of the Kehl/Strasbourg barrier, and enforced by active forestry activities, such as planting trees with high economic benefits but low water tolerance (e.g. sycamore) (Armbruster et al, 2006). Societal pressure and legislative requirements on ecology forced the program developers to change their strategy. Accordingly, they decided to apply the concept of 'Ecological Floods' (*Oekologische Flutungen*) that has initially been developed by the World Wildlife Foundation (WWF).

The idea of Ecological Floods (EF) is to get floodplains 'used' to wet circumstances again. Floodplain typical abiotic characteristics and dynamics are being restored. This would lead to semi-natural conditions for floodplain habitat development, including the re-establishment of floodplain species and the habituation to the occurrence of floods (Gewässerdirektion Südlicher Oberrhein/Hochrhein, 2000; Landesanstalt für Umweltschutz, 1999). Polder Altenheim has been used to first test the concept before wider application to all polders in the IRP. The pilot thus functioned as a tool for early policy evaluation. To achieve this near-natural state, the flood regime in the area needs to be synchronized with the discharge regime in the river. The discharges chosen are related to the discharges of the Rhine with a lower limit set by the demands of hydropower generation of EdF (Électricité de France) and an upper limit set by the time needed to prepare the area for retention. Inlet and outlet structures are placed in the polder to control both the retention and the ecological floods.

The number of ecological floods in the period 1987-2000 was 72, of which the majority (44) had a low intensity thereby only filling the existing water bodies and 12 had a high intensity thereby inundating practically the whole area. The duration of EF varied in the period 1990-1999 from 6-78 days/hydrological year (1/11-31/10) (Gewässerdirektion, 2000). Meanwhile the area has been used four times for retention. A monitoring program existed between 1993 and 1996.

The pilot showed a clear focus on knowledge development and learning. Not only because of the questions posed, but also because of the extensive monitoring program and documentation efforts and reflection on transferability of knowledge and experiences (Landesanstalt fur Umweltschutz, 1999). Initially, knowledge questions on appropriate retention schemes and ecological impacts were central. Engineering, ecological, but also administrative and economic issues were represented in an interdisciplinary team. The public context became later of importance, particularly during the application in other areas.

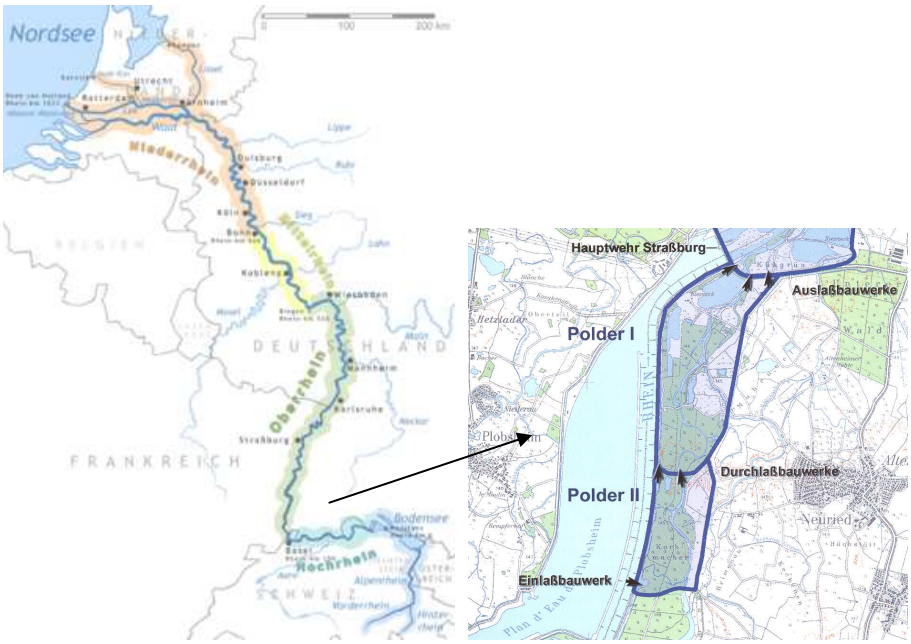

Figure 4. Map of the Rhine basin and the different sections, including the Upper Rhine (Oberrhein). Polder Altenheim is located just south of Strasbourg and has been split in Polder I and II to control the floods. The main structures include an inlet, outlet and a passage (Gewässerdirektion SO/HR, 2000). (Source: Ullrich, Threedots available on http://www.rheinangeln.de/html/der_rhein.html).

Biophysical effects included improved water quality and vegetation and wildlife had adapted since new habitats have been created and seeds supplied by the Rhine water. Societal effects included the establishment of an interdisciplinary team, with disciplines that previously did not cooperate, reduction of forestry activities, the development of compensation schemes for farmers, and the exclusion of future spatial development in the area. Even though in general citizens in the nearby towns were satisfied with the results (Stoll 2006), finding periods for applying EF was challenging. In every period of the year different groups (e.g. hunters, farmers, and foresters) felt disadvantaged. Initial knowledge developed concerned the design of the concept and the area (e.g. flooding regimes and engineering structures), physical impacts such as water levels of the main stream, flow patterns in the polder and ecological responses.

In terms of diffusion, the pilot itself has been extended into an open-ended project and the application throughout the IRP has been encouraged. The developed knowledge on for instance Rhine discharges, designs of engineering works and ecological processes enriched the further development of the concept in the IRP. After 1996 implementation projects have been started, but this process was more challenging than expected. In 2001 only two out of 13 areas (including Altenheim) were installed as retention areas (Gewasserdirektion sudlicher oberrhein/ hochrhein, 2001). In particular, resistance comes from citizens who felt threatened and did not agree with the principles of EF. Citizens founded organisations, started lawsuits and moved politicians to explicitly support them. The nature of the problem thus changed when started diffusing the concept. This resulted not directly from larger geographical or spatial boundaries but from an enlargement of the problem scope. New issues and actors had to be included.

5.3 Pilot project at the Langen Erlen (Basel): Introduction of surface water-groundwater interactions in an urban recharge polder

The Wiese is a tributary of the Rhine River that runs through Germany and Switzerland (Figure 5). The 'Langen Erlen' floodplains near Basel, Switzerland, are used as infiltration area for the drinking water producer (IWB) and for recreational purposes. The IWB (Industriele Werke Basel) is a governmental organisation and uses a unique and long proven, filtering system for water production (Rüetschi, 2004). Slightly filtrated Rhine water is let in the floodplain of the Wiese where it can fill up the groundwater table and subsequently distracted for ground water. The water is let in the area during 20 days, then the areas are left dry for 10 days. The water production uses relatively little energy, while the area can be used for recreation. This system exist since 1964; before, the Wiese water was let in, but this was considered as with a disputable quality, or at least with a higher risk of pollution since the discharge is smaller and upstream German waste water treatments exist, which forms a risk. The IWB has a vital function for the region and is highly acknowledged for their performance.

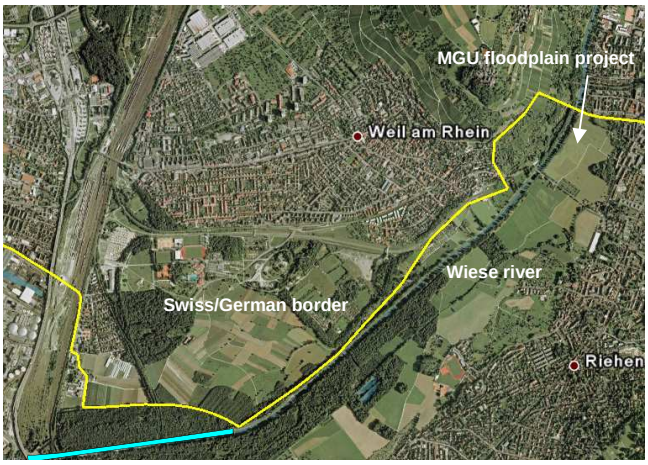

Figure 5. The Langen Erlen floodplains along the Wiese river, near Basel (source: Googlemaps).

The University of Basel developed the research questions within the MGU-framework (Mensch, Gesellschaft und Umwelt, which is a fund of the Kanton Basel-Stadt), whether revitalising former floodplains in urban areas can have economic, ecological and social use and to what extent the revitalisations endanger or exclude existing uses (Wüthrich et al 2001). More specifically, the stellimatten project (which is a part of the Langen Erlen floodplains) was developed where the idea was to revitalise the forested floodplain by inundating it with local water. The water gets cleaned by going through the floodplain and this can then be further distributed over larger areas or let back in the Wiese. The improved groundwater-surface water interaction can then enhance conditions for ecology, while drinking water production and recreation would not be endangered or even enhanced through increasing attractiveness and reducing costs. The project was developed in cooperation with the IWB and local governments and ran from 2000-2003. The IWB is land owner of these floodplains.

The area chosen for a pilot project is small (0.5 ha.) and further risks have been limited by choosing an area that has very little impact on the drinking water production since the soil is dense there, which means that the production is low. Additionally, since the area is far off from the collection point of the Rhine, water transportation costs are high. Replacing this with Wiese water could reduce the costs. The water producers and the environmental organisations are initially sceptical, but curious, but the other actors (e.g. university, kanton) are positive. Since there has been pressure for ecological restoration for over 20 years, the IWB provided an area for testing.

The actors co-operated in several ways, including three-monthly meetings. The research is

shared: the IWB monitors the ground water sources, whereas the university measures groundwater and manages the installations. Citizens are passively involved by explicitly inviting them to the area and make information available on panes on a trail.

Initially the project was set up to answer research questions and to give it a societal meaning in the sense of area improvement and potential purification system improvement. The project was thus research driven, but because of the belief of the researchers it was also specifically performed to show and convince the water producers. During the project this became more and more important, the university outspokenly hoped for starting in the other 13 recharge areas. They thought that as when the concept could be proven to work, scaling up would follow. So, despite its initial explorative function, they the project quickly transformed into a project with an advocacy function

The pilot project had multiple effects. First, the area showed improvements in biodiversity, particularly amphibians benefited from the change in regime. The water quality could be improved, while the ground water extraction wells were not affected during the pilot period. In terms of actor relations, different actors started to cooperate, but this did not improve their relation. They hold different expectations and started to distrust each other even more. Where the IWB is blamed for being conservative, the university is blamed for being an environmentalist and not neutral. A kanton's hydrologist was dismissed from his function, because he was considered as non-neutral. The goal to bridge two functions has not been achieved. Citizens generally supported the project and consequent changes in the landscape (Knall, 2006). Knowledge has been developed on the concept, ecological mechanisms, citizen acceptance and measuring methodologies. A clear monitoring program has been put in place.

In terms of diffusion, the university outspokenly strived after implementation in all 13 areas of the IWB. Initially, they started to let water in a low lying part to make a corridor between the Stellimatten and the next forested area. This is still in operation, but the project did not get any official follow-up. The IWB did not consider the risks of working with polluted Wiese water that outweighed the benefits of reduction in transportation costs of Rhine water.

For the future there are now some discussions between the different municipalities on the Swiss and German side of the border to remove or improve the waste water treatment plants. This might in the future give renewed opening for reconsiderations of the project, but currently, the project has been closed down. As an alternative, the university started a new pilot project in another area, where only recreational interests played. They could build upon knowledge about methodology and ecological mechanisms developed in the Langen Erlen project.

5.4 Pilot project at Saldanha Bay: The development of the Saldanha Bay Water Quality Trust

Saldanha Bay is a coastal embayment on the west coast of South Africa approximately 100 km north of Cape Town (see Figure 5). The system is directly linked to the Langebaan Lagoon, a shallow tidal area of great conservation importance (i.e. Ramsar site under the *Convention on Wetlands of International Importance especially as Waterfowl Habitat*). In the early 1970's the bay was targeted for development as a major international port when a jetty was built for iron ore export. Further developments followed which including dredging to allow for the entry of large ore-carriers, the construction of a multi-purpose terminal and a small-craft harbour to cater for the increase in recreational and tourism activities in the area. Currently, oil is also imported through this harbour. Since 1984 mussel mariculture ventures have been established in the sheltered waters of Small Bay and Big Bay, leading to potential threats of organic loading. In addition the area receives effluent discharges from fish processing industries, as well as urban runoff from the adjacent towns (Clark and Atkinson, 2006).

In the 1990s individuals with an interest in the area started to create awareness for the need to address these potentially conflicting issues which led to the establishment of the Saldanha Bay Water Quality Forum Trust (SBWQFT) in June 1996 (Van Wyk, 2001; Taljaard and Monteiro, 2002). The SBWQFT is a voluntary organization comprising officials from local (municipality, nature conservation organisation), regional (regional office of the Department of Water Affairs and Forestry) and national authorities (Department of Environmental Affairs and Tourism), representatives from all major industries in the area (e.g. National Ports Authority, seafood processing industries, marine aquaculture farmers) and other groups who have a common interest in the area (e.g. tourism organisations). The main purpose of the SBWQFT is to work towards maintaining water quality and ecosystem functioning so as to keep Saldanha Bay fit for all its designated uses. Although the Trust does not have legislative powers, it acts as an advisory body to legislative authorities that are also members of the forum. The pilot project has developed bottom-up, in which an approach is put in place to implement existing national policy and to deal with local coastal management issues, so to stimulating innovation. Accordingly, the pilot could initially be characterised as a management instrument to deal with conflicts and stimulate innovation.

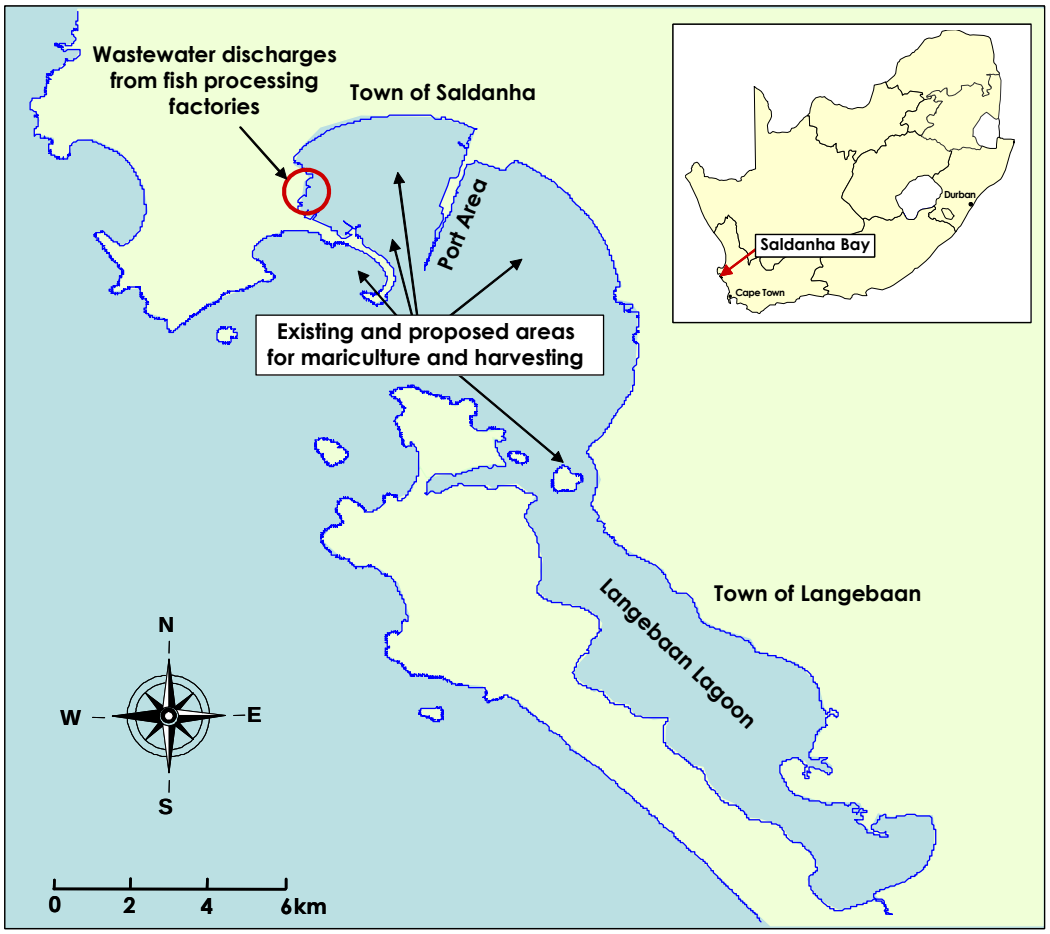

Figure 5. Saldanha Bay, South Africa.

As a result of the establishment of the Trust, water quality in the Bay has improved significantly, while the different activities could still be undertaken. Pollution hotspots have been identified and there has been pressure, for instance on the Department of Water Affairs to license wastewater discharges from fish processing factories, mandated under South Africa's National Water Act. This is an effect of the interactions of stakeholders that

previously did not exist. People learned about other uses in the area and moreover how they affect each other with their activities.

Within the Trust some social control exists. For instance, when there was an oil spill, the polluter had the chance to explain what happened and to promise improvements. Local experts willing to invest time in the activities of the Trust are also welcomed. A financial mechanism has been put in place by Trust that allowed for commissioning of scientific investigations and monitoring programs of which results are communicated through platforms such as the public meetings and the publication '*Bay Watch'*. Scientifically sound information is therefore disseminated to the broader community facilitating transparent and informed decision-making on the management of the area (Taljaard and Monteiro, 2002, Clark and Atkinson, 2006). Overall, with the Trust, a mechanism has been put in place to deal with coastal management issues of the area.

Initially, the Trust has been installed as a pilot project, but gradually the SBWQFT evolved as an important NGO. The nature of the organisation has not changed significantly, although the issues addressed do change over time, whereby it ensures a continuous communication amongst the stakeholders. The feeling of its success is probably best explained by a quote from '*Bay Watch'*, the annual publication of the Trust (SBWQFT, 2004): '*This is a most unique forum in that, as far as I am aware, it is a the only non-government body that is totally successful in melding the private sector with their contributions and the government with their overseeing capacity, to form a unit that is ultimately functional and effective*.'

There, however, is concern that the activities of the Trust may still be driven by committed and enthusiastic individuals (e.g. their chairperson). It may thus not have overgrown the dependence on individuals and is still fragile. There was not an explicit pre-defined program to monitoring the progress of this pilot, although evaluative studies on the Trust have been made (e.g. MSc thesis by Van Wyk, 2001). This pilot is now widely promoted in national best practice guides as a model for local institutional arrangement, e.g. in '*South Africa's operational policy of the disposal of land-derived wastewater to the marine environment'* (Taljaard et al., 2006a; 2006b).

The Trust provides a good example of a means to support the implementation of the Integrated Coastal Management Act soon to be promulgated in South Africa. So far, there has not been real dissemination, but the Trust has certainly enabled more effective implementation of policy in the Saldanha Bay area.

6. Case comparison and findings

The individual pilot projects are in some respects comparable (e.g. conceptual innovation), but show a variety in their nature (e.g. scale, knowledge focus), use, relation to the context (e.g. position in water management field). An overview is given in Table 1. In Table 2 we summarize the direct effects, while in Table 3 we provide a detailed overview of the diffusion of the different cases. Based on these comparative tables and additional insights from the cases we provide preliminary observations in patterns, hurdles and dynamics surrounding pilot projects, guiding the course of the pilot project and so possibly contribute to policy transitions.

Table 1. Overview of the characteristics of the four pilot projects.

Pilot Cases / Characteristics	Beuningen	Altenheim	Basel	Saldanha Bay
Use	Problem solving and Explorative	Initially: Early evaluation Later: Advocacy	Initially: Exploration Later: Advocacy	Initially: Conflict management & Stimulating innovation Later: Communication
Scale	Not confined (fits with 'standard' floodplain management practices)	Confined in problem scope (i.e. biophysical)	Confined in space (i.e. partial floodplain) and time (i.e. 3 years)	Confined in space and scope (i.e. coastal water quality)
Level of innovation	n.a.	n.a.	n.a.	n.a.
Substance	Biophysical approach	Biophysical approach	Biophysical approach	Participative approach
Relation to policy	In periphery, but fits with policy paradigm	Part of policy program, fit with paradigm	In periphery, in line with national policy but not with local	In periphery, enables to implement existing policy
Actor involvement and relations	Co-production main stakeholders (landowner, user, expert, superintendent)	Interdisciplinary team; professionally oriented	Initiator and landowner	Local stakeholders and governmental organisations
Knowledge development orientation	No formal monitoring Learning enhanced trough handbook, workshops, field visits	Monitoring program Interdisciplinary learning Later: citizen communication and participation	Monitoring program, scientific studies, informing citizens	No monitoring program Evaluative studies Internal research questions
Particularities	Site and resource availability, freedom in design space	Media attention, political commitment	Site availability, resources	Resources, participation
Boundary conditions	Interactive	Social: Internal Biophysical: interactive	Internal	Interactive

n.a. "not available"

Table 2. Overview of direct effects of the four pilot projects.

Effects / Pilot Cases	Beuningen	Altenheim	Basel	Saldanha Bay
Direct response	- Partial implementation - Increased discharge levels, ecological enhancement - Collaborative structures - Explication of roles	- Biophysical goals achieved - Flooding schemes	- Restored groundwater-surface water interaction - Citizens support - No impact on drinking water production - Increasing distance between actors	- Social control - Financial mechanism - Improved water quality
Knowledge development	- Understanding of designing CFR - Delivery of a handbook for practitioners	- Increased understanding interaction concept-context (e.g. externalities)	- Explication perception on other actors - Understanding of interactions of groundwater and	- Strong internal social learning - Stimulus for research on impacts of human uses for water

			surface water	quality

Table 3. Nature and direction of diffusion of the pilot projects within the four cases.

Diffusion pathway / Subject of diffusion	Dissemination	Organic Scaling up	Transposing Scaling up
Ideas/ Assumptions	NL: refining concept, existing project reshaped with concept	NL: -	NL: proposed policy program
	GE: refining concept, 2 additional projects	GE: extension in time and problem scope	GE: included in policy program (13 sites), contextualisation concept (reduced ambition level)
	CH: replacement (new project), initial pilot stopped	CH: initially expansion area, later dying out	CH: -
	SA: -	SA: extended problem scope	SA: included in national guidelines as best practice
Artefact	GE: inlet and outlet structures	n.a.	n.a.
Institutional Design	NL: actors take same role in new pilot	NL: -	NL: -
	GE: initial continuation interdisciplinary team	GE: broader actor involvement	GE: - (return to state before pilot: dismantling interdisciplinary team)
	CH: -	CH: -	CH: -
	SA: -	SA: increasing set of institutional instruments, Trust developed into NGO	SA: included in national guidelines as best practice

NL: Beuningen Pilot Case; GE: Altenheim Pilot Case; CH: Basel Pilot Case; SA: Saldanha Pilot Case; n.a. "not applicable".

Remarks and observations from the comparative analysis of the cases include:

(a) Changes in function

The three main pilot functions are categorized as knowledge development, managerial and/or political entrepreneurial. It is also observed that the function of three of the four pilot projects changes over time. Initially the function is knowledge and problem-orientation, while later they shift towards more advocative and communicative functions. This means that pilots can be dynamic entities. However, the Beuningen pilot did not really change towards a communicative or advocative function in its later stages because its designed purpose was to convince interested parties based on the principles, rather than on the 'evidence' provided by the pilot. The process towards the implementation of the pilot seemed to be more important. For none of the actors the concept was 'optimal' but the feeling was created that this was overall an elegant solution. Additionally, room for negotiation remained available, even if this meant concessions had to be done towards the concept.

(b) Knowledge management

A claim on knowledge development not necessarily means that there are clear monitoring and evaluation programs to capture the new created knowledge. Additionally, the nature of knowledge considered of importance can vary. Where in Basel and Altenheim the focus was on knowledge of the functioning of the physical system and the interaction of the concept

with the context, in Beuningen case the focus was more on knowledge of design processes and conceptual functioning of the concept. This knowledge has been used to diffuse the idea.

(c) Scales
Despite the often-present expectation that pilot projects are conducted on a small scale, not all projects have clear confined scales. Additionally, scales can be confined on several dimensions and not necessarily all are confined in the pilots.

(d) Relation with the context
As a result of the implementation of ideas on 'good management' (e.g. institutionalization of interdisciplinarity in the Altenheim case) boundaries between the pilot and the context start to shift. Previously contextual elements are now internalized in the pilot project, but at the same time the boundary between the pilot and the context has become thicker. There is namely a stronger internal focus. Contextual developments such as changed ideas on democracy and the wish of citizens to have an influence on decision-making are then not recognized in early phases. The developments have to become more extreme (e.g. lawsuit) before noticed and re-establish the interaction between the pilot and the context.

When the pilot is not recognized by policies (either local or national), there is small chance of diffusion into policies. Only in case the pilot has been developed from policy there is direct feedback into the policies (pilot case at Altenheim). The user, in this case the policy-developer, has to recognize the pilot as useful and should thus relate it to his concerns. At the same time, this reduces the possibility for radical innovation. The ideas in fact had already been developed and shaped the policy program, while the pilot contributed to refinements of the policy program.

(e) Role of initiators, key actors and institutionalization
In Beuningen, Basel and Saldanha Bay diffusion seems to depend on convincing powers of the initiators. Diffusion occurs when the initiators continue to expand the project or initiate new projects themselves (e.g. Basel), or when knowledge and enthusiasm has been transferred to the key actors for new projects such as the main authority and land owner who then start new projects (e.g. Beuningen). Additionally, when relations between actors are not good, legitimacy is questioned and the initiators can therefore not convince critical actors, the pilot will not be continued, or only replaced to another site where different actors are involved (Basel). The legitimacy of actors in the Basel case could be questioned since not all relevant stakes were represented (particularly the environment-related interests) for which the university felt responsible and so were regarded as environmentalist rather than scientists. For Saldanha Bay holds that since the pilot is not independent from the initiator (yet), participants fear that when the initiator, who is a person putting a lot of energy in and can make people enthusiast, will retire, the Trust might not continue.

Comparable to the Basel case Taljaard et al (2006b) found that inclusion of critical actors in the Saldanha Bay case contributed to the effectiveness of the trust since these were the actors holding executive powers. In contrast to these three cases, the innovation of Altenheim has been institutionalized from the start. This seems to guarantee its further use over a large number of areas, even if opposition can be expected and the concept needs to be adapted.

Overall, critical for diffusion and policy transitions seem to be either key persons (see Meijerink and Huitema, 2009, forthcoming), or transfer of knowledge or enthusiasm to key actors, and institutionalization. The latter two contribute to disconnect the pilot of the initiator. Institutionalization provides a more stable continuation of the use of the innovation and makes the dependency on individual people less prominent. This puts us in a paradox though, since the new institutionalization will become a hurdle for new innovations and then need to be broken down first again.

(f) Role of effects

That effects turn into dynamics for further diffusion, stems for instance from Saldanha Bay where strong and explicit social learning was identified. Previously unaware actors now realized how they influenced water quality and so influenced the use of the water system by other actors in the region. Another example comes from Altenheim. The developed knowledge on citizen concerns caused dynamics to change the designs and implementation schemes of the innovation. That knowledge is often recognized as a source of power and legitimacy (Francis Bacon, Nonaka 1995; Pawson and Tilley 1997) and subsequent change have been induced has been confirmed by the Saldanha case. Taljaard et al. (2006b) found that a key to the success of the Saldanha Bay Trust was a sound scientific information base, containing explicit scientific assumptions and outcomes, by which authorities, and also local actors, were empowered to partake in the decision- making process.

(g) Role of 'success'

'Success' might contribute to diffusion, since it would provide a good example and can thus convince actors, but the Basel and partly the Altenheim case show that this is not conditional. Both cases were considered successful in achieving the initially stated, biophysical, goals, but not diffused since they could not convince all actors to support the idea. The pilots have not been that critical to change people's perceptions (Flyvbjerg, 2006). In contrast, the Beuningen case shows that biophysical success is not even a condition for diffusion: there has been diffusion before the pilot has developed evidence.

(h) Representativeness

A problem with diffusion of pilot projects is representativeness (Sanderson, 2002). First of all, pilots are particularly strong in delivering context-dependent knowledge. The level to which this can be used in other situations is therefore not always obvious. Second, pilot projects are often seen and treated differently than 'normal' projects. This for instance expresses in the protection it had, (media) attention and the 'spirit of experimentation'. The latter implies that people allow for more risks, are creative and enthusiast, are open for learning and tolerate 'failure' (Vreugdenhil et al., 2009 forthcoming). When diffusing, these special treatments no longer apply. Third, when scaling up, not only the context, but also the nature of the projects changes changes. For instance in the Altenheim case, in the new areas more issues are included that are of interest to local stakeholders, which means that the initial pilot is not in all respects representative for the new area. This includes both process elements such as governance style and content elements such as the design of flooding schemes. Reduced representativeness might therefore result in reduced effectiveness of a pilot and in a decline of its convincing powers.

7. Conclusions

Pilot projects often used in different policy domains. The purposes for which they can be used can be highly diverse, but one of the desires of initiators who have for instance strong beliefs in a concept or have large (commercial) interests is to further diffuse the innovation. Through this diffusion they can possibly contribute to policy transitions. In transition theories they are considered one of the few means to actively influence policy change. To gain more insight in these assumptions, this paper focused on the nature and functioning of the construct pilot projects and particularly the dynamics surrounding them that influenced their diffusion into their domain. Accordingly, strategies to enlarge their effectuation can be better grounded.

Pilot projects have been conceptualized as socially constructed processes that continuously interact with their context. Regarding pilot projects as processes allows to see how early developments influence later stages. Diffusion has been conceptualized as a combination of dissemination and scaling up. The elements of interest that can be diffused include the ideas and assumptions, artefacts and concepts. Four case studies on pilot projects focussing on

water management approaches showed amongst others how some existing views on pilot projects have been unravelled (e.g. their scales and the type of knowledge derived from pilots, how knowledge management has been designed), what type of dynamics can be identified (e.g. their function changes over time, pilots are subjected to interpretation, the role of effects, interaction with and relation to the context) and other factors that influence diffusion (e.g. role of initiators, role of success, issue of representativeness). Since diffusion does not occur autonomously, strategies to enhance this can be implemented. These should be undertaken at the appropriate moment, which is often earlier in the process than expected. Ideas that could be included in strategies are to have all relevant stakes represented by their legitimate stakeholder and to make enthusiasm initiator-independent.

This paper focussed on the impacts of single pilot projects. The case studies showed that the level of impact on policy development can be highly variable. It was absent in Basel, so far predominantly local in Beuningen and Saldanha Bay, but highly influenced the overall policy program in Altenheim. The latter however, was in contrast to the others initiated from the policy level, whereby the policy was not so much developed due to the effects of the pilot but rather was refined. The policy itself was developed on earlier developed ideas and assumptions. In contrast to this study on single pilots, which can be convincing if critical cases are used (see Flyvbjerg, 2006), literature often suggests that policy transitions are more the effect of accumulation (Raven, 2007). To find accumulation effects not only more pilots need to be studied and particularly how these are related to each other, but also the patterns of decline and dynamics causing this need to be further elaborated such that full life time cycles of pilot projects can be assessed.

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