Pilot Projects for Evidence-Based Policy-Making: Three Pilot Projects in the Rhine Basin

Heleen Vreugdenhil
Delft University of Technology and
Maastricht University
(The Netherlands)

Philippe Ker Rault
Delft University of Technology
(The Netherlands)

Key Words: Knowledge, Diffusion, Innovation, Policy, Realizing EBPM, Evidence, Perceptions, Integrated Water Management, Floodplain Revitalization

Abstract
In Evidence Based Policy Making, pilot projects have been recognized as important tools to develop 'evidence' of policy innovations. This paper presents a theoretical and empirical study of three water management pilot projects in the Rhine basin to deepen understanding of how they can contribute to EBPM and which limitations and problems may arise when realizing EBPM. Three types of pilot projects have been identified: *research*, *managerial* and *political-entrepreneurial pilot projects*. To different extent all types of pilot project have the following effects: biophysical- and actor-network system response, knowledge development and diffusion into wider public policy. The Beuningen pilot demonstrated that anticipated evidence can be sufficient to change policy or management due to its strong managerial characteristics and that the lack of policy ambassadors limits its institutionalization. The Basel case illustrated the importance of interpretation of evidences and the consequences of the use of evidence as alibi. The Altenheim case demonstrated that top-down research pilot projects are easily institutionalized but lack to take the step to dissemination. In order to contribute to the realization of EBPM, pilot projects might need to be designed as both a means to develop and to transfer evidence through experience.

Zusammenfassung
Im Rahmen von evidenzbasierter Politikgestaltung (EBP) werden Pilotprojekte als wichtiges Instrument betrachtet, um Erkenntnisse (Evidenz) über politische Innovationen zu generieren. Dieser Beitrag präsentiert eine theoretische und empirische Analyse von drei Wassermanagement Pilotprojekten im Rheinland. Ziel der Analyse ist, besser zu verstehen, wie solche Projkete zu EBP beitragen und welche Grenzen und Probleme bei der Realisierung von EBP auftreten können. Es wurden drei Typen von Pilotprojekten identifiziert: wissenschaftliche, betriebliche und politisch-unternehmerische Pilotprojekte. Solche Pilotprojekte können in unterschiedlichem Ausmass folgende Effekten haben: biophysische- und Akteur-Netzwerk-Systemrückmeldungen, Wissensentwicklung und Diffusion in weitere Bereiche. Das Beuningen Projekt demonstrierte, dass im Falle eines stark unternehmerischen Pilotprojkets antizipierte Evidenz für eine Politik- oder Managementänderung ausreichen kann. Das Fehlen von politischen Repräsentaten hingegen limitierte die Institutionalisierung in diesem Fall. Das Pilotprojekt Basel veranschaulicht die Bedeutsamkeit des Interpretierens von Evidenz und die Konsequenzen der Nutzung von Evidenz als Alibi. Der Fall Polder Altenheim zeigt, dass Top-Down Pilotprojekte leicht zu institutionalisieren sind, jedoch kaum eine weitere Verbreitung finden. Damit Pilotprojekte einen Beitrag zur evdienzbasierten Politikgestaltung leisten können, ist es vermutlich notwendig, sie so zu gestalten, dass sie sowohl der Evidenzentwicklung als auch dem Evidenztransfer durch Erfahrung dienen.

1 Introduction

Pilot projects are commonly applied instruments in diverse policy domains, including water management. They provide a space to introduce and test innovations without large risks. Risks are reduced by confining the geographical scale or the duration of the intervention. Additionally, ‘failure’ of the innovation is somewhat more tolerated. These conditions enable actors to participate more easily (Vreugdenhil et al. 2010).

In Evidence Based Policy Making (EBPM) also, pilot projects have been recognized as important tools to develop ‘evidence’ of policy innovations (Cabinet Office 1999). Although there is no unanimous definition of Evidence Based Policy Making (EBPM) it is claimed to (Cabinet office 1999; HM Treasury GSRU 2007):

- Improve understanding of an issue and its associated actors

- Develop solution in collecting evidences and shared work
- Test solutions and communication practices
- Enrich understanding of contexts (local, political, social, technological, economical...).

Furthermore, EBPM is a dynamic concept that applies at different stages of policy development: initiation, implementation, defense and justification, evaluation and readjustment

In our understanding, the role of pilot projects in realization EBPM consists of eliciting grounded knowledge, identifying what works, and testing policies. The evidence developed in pilot projects on the functioning of the policy innovation in a practical setting could be used to inform policy-making, which can be improved based on the evidence (Pawson and Tilley 1997; Cabinet Office 2003). In other words, pilot projects can serve realizing EBPM by guiding policy-making with knowledge of what is appropriate for specific problems, which is what EBPM is about (Sanderson 2003).

The importance placed on pilot projects is increasing due to the increasing technological and societal complexity of contemporary public policy making (Cabinet Office 1999; Ker Rault 2008), the loss of confidence of the public in many professions and public bodies, and the requirement of national governments to make use of pilot projects to find out whether policies do or do not work as intended (Solesbury 2001; Cabinet Office 2003; HM Treasury GSRU 2007). For researchers it provides a tool to improve innovations and to cooperate with societal actors and to collect financial resources. Practitioners can find out whether certain innovations make management more efficient and are thus worth to be applied at a larger scale. The number of pilot projects initiated is difficult to estimate, because both policy and non-policy actors in any policy domain can initiate a pilot project. However, to give an idea of pilot projects initiated by practitioners, the Dutch water management authority has conducted about 40 pilot projects in river and coastal management over the last 5 years.

Despite the prosperous expectations and enthusiasm with which pilots are initiated, results are often considered disappoint-

ing (Sanderson 2002; De Groen *et al*. 2004). Policy-makers seem to 'abuse' pilot projects as alibi to show supremacy of their personal ideas, rather than using them to learn from. Particularly in a narrow view of EBPM addressing the issue of 'what works under which circumstances', pilot projects are therefore not uncontested. Additionally, despite their wide use, pilot projects have received little research attention (Huitema et al. 2009), especially in a trans-disciplinary domain such as water management.

In this paper, we theoretically and empirically study pilot projects to deepen understanding of how they can contribute to EBPM and which limitations and problems may arise when realizing EBPM. Let us note that pilot projects can also be used for many other purposes, but for an analysis thereof we refer to Vreugdenhil et al. (2010). The research questions addressed in this paper are the following:

- Which types of pilot projects contribute to the realization of EBPM?
- Which factors and mechanisms influence the realization of EBPM through pilot projects?

In attempting to address these research questions and following the presentation of the methods in section 2, we develop a framework of analysis (section 3). We have identified three types of pilot projects, all of which function differently for EPBM. We discuss their characteristics and effects to policy and management. Next, we study three pilot projects in the Rhine Basin on their use, characteristics and effects (section 4). We identify to what extent those pilot projects contributed to EBPM and we discuss factors and mechanisms influencing the realization of EBPM (section 5). Last we provide some recommendations for enhancing their impact on policy-making (section 6).

2 Methods

The analysis of pilot projects in relation to the realization of EBPM for this paper consists of three major steps.

First, elaborating on a desk-based review of 16 out of 40 pilot projects conducted by the Dutch water management authority in

river and coastal management over the last five years, we develop an analytical framework of pilot projects (Vreugdenhil et al. 2010). We identify three types of pilot projects: *research*, *managerial* and *political-entrepreneurial* pilot projects. We conceptualize the types of effects a pilot project can have in terms of *biophysical* and *actor-network responses*, *knowledge development* and *diffusion*. Bearing in mind the importance of 'what works when' objective of EBPM (Solesbury 2001), we focus mainly on diffusion of knowledge gained in pilot projects. By understanding diffusion one might gain insights in mechanisms associated to the use of developed knowledge as evidence for policy-making.

Second, we apply the framework to three case studies in the Rhine Basin. The generic policy and economic contexts of the case studies is comparable. Indeed, they are all part of a long history in formal international cooperation of nearly two centuries along the Rhine. Recently, the international cooperation has been reinforced by the European Water Framework Directive, requiring countries sharing a river basin to further enhance cooperation and achieving comparable quality standards. The case studies are all pilot projects dealing with floodplain revitalization, aiming to combine ecological enhancement with the dominant purpose of that floodplain i.e. flood defense or drinking water production. The pilot projects have all been conducted in the public sphere in multi-actor contexts. Actors include universities, research institutes, public agencies, NGOs and citizens, representing diverse disciplines and stakes ranging from hydraulics and ecology to social geography. Important to the case study selection was also that the pilot projects achieved a broad range of effects. Lastly, accessibility to information provided an additional practical reason to select the three pilot projects.

The first case study, 'Altenheim' in Germany, was chosen to provide an example of a finalized pilot project to enable the evaluation of longer-term effects of a pilot project. The pilot project was initiated from the 'classical' EBPM point of view, meaning that this was the first application of a policy program and results were expected to provide the evidence of whether the innovation worked or not (Pawson and Tilley 1997, Cabinet Office 2003).

The case study illustrates that despite the confirmation of the policy program on the evidence from the pilot project, implementation remains difficult. The second case study, 'Beuningen' in the Netherlands, illustrates that evidence can find its way into policy-making even when a pilot is not fully finalized yet. The third case study, 'Basel' in Switzerland, provided an example of how a pilot project can harm relationships and so limit the realization of EBPM (Vreugdenhil et al. 2009, Vreugdenhil and Slinger 2009, Vreugdenhil *et al.* 2010).

Data for the case studies are collected through (i) participation in the Dutch case study in 2004 by the first author, (ii) document analysis and (iii) 24 interviews between 2006 and 2008 with river managers, scientists, citizens' representatives, floodplain managers and drinking water producers. The participation consisted of contributing to designing interventions and modeling their hydraulic impact. Additionally, related studies on the influence of scale perceptions on the innovation were performed (Vreugdenhil et al. 2010b). Attendance to project meetings, discussions and workshops was very valuable to gain inside understanding of pilot projects' dynamics. Interviews focused on the history of the project, on actors' perceptions on river management, on knowledge development and on the diffusion of the project into policy-making.

Third, we elicit factors and mechanisms of importance in the realization of EBPM from the pilot projects. We discuss which characteristics of pilot project may influence EBPM. Of particular interest is the role of perceptions. Based on the insights in influential factors, we propose some strategies for pilot project initiators to increase the effectiveness of their pilot project for EBPM.

3 A framework to analyze pilot projects

We first present three types of pilot project based on the intention of their initiator. Then, we refine the analytical framework with six characteristics and potential effects on management and policy-making.

3.1 Three pilot project types

Head (2008) argues that three lenses of evidence-based policy can be distinguished. These include scientific research, political judgment and professional practices. Similarly, we identify that pilot projects can be used for three different purposes in EBPM. Researchers, practitioners and politicians can be all involved in initiating a pilot project. The three pilot project types include:

- Research Pilot Project
- Managerial Pilot Project
- Political-Entrepreneurial Pilot Project

Research pilot projects are primarily focused on the development of knowledge about the innovation tested. The knowledge is of a different nature than the knowledge developed in desk-based studies such as conceptual or mathematical modeling (Walters 1997). Indeed, the focus of the pilot study is on the interactions between the innovation and its societal and biophysical context. Research pilot projects are either initiated by researchers or by policy makers. When initiated by researchers, the developed knowledge is used to inform policy-making and adjustments in the innovation can be made to make it better fit with the context. Researchers who have developed an innovation can initiate research pilot projects to not only test and further develop the innovation, but also to communicate with practitioners about the innovation. As such, researchers try to find entrance to the policy debate and realize EBPM (Solesbury 2001). Knowledge development is bottom-up.

In contrast, research pilot projects are initiated by policy-makers such as government agencies who have developed a specific policy program. These pilot projects are referred to as ‘early evaluation’ (Cabinet Office 2003) and the knowledge development process and the informing of policy-makers is top-down. This is probably the most common form of pilot projects in EBPM (Pawson and Tilley 1997). In early evaluation research pilot projects, far developed but yet not implemented policy programs are first tested on a small scale. The policy program is implemented on a selected sample. Knowledge questions are specific to the effectiveness and efficiency of the intended policy

('does it work'), and possibly the identification of negative side effects. The developed 'evidences' provide the input for approval or rejection of the policy program. In case of approval, the program can be rolled out at full scale (Cabinet Office 2003). In the researchers' induced pilot project, in contrast, the research questions are usually broader, for example addressing methodologies and implementation processes.

Managerial pilot projects are initiated from a pragmatic point of view. They are initiated to resolve a local problem for which no standard solutions exist, or to implement a fully developed policy program. Policy actors have difficulties implementing the policy program in a conventional way and use the pilot project format to implement it in a staged process. The pilot projects are means to establish communication between actors that usually do not cooperate. Through cooperation actors experience similar processes, can exchange knowledge and learn to understand each other's point of view. The insurance function is also of large importance in this type of pilot project. This means that the project is explicitly conducted in a pilot project format to make use of the 'special' conditions that a pilot project benefit from. For example, large-scale failure is prevented and thus financial risks are reduced when the innovation does not to work or has negative side effects. The tolerance towards failure enables people in high-rank positions, such as ministers, to support the pilot or even to participate. The latter in its turn strengthens the relation of the pilot to policy-making and thus to realizing EBPM. The initiators of managerial pilot projects are usually policy practitioners such as government agencies; they learn through participation. Although knowledge development is less dominant or explicit than in research pilot projects, their main mechanisms to the realization of EBPM is the promotion of communication, cooperation and shared experience.

Political-Entrepreneurial pilot projects are pilot projects initiated for opportunistic reasons by entrepreneurs. Entrepreneurs can come from politics, commercial businesses or even research institutes. In a political-entrepreneurial pilot, initiators for example attempt to influence a policy process for career development or strategic reasons. The purpose of a political-entrepreneurial

pilot project is often to get an issue on the agenda, or even to delay decision-making or to divert attention and save political face. The intentions of initiators are not always clear. The development of a deep understanding of the system is of less importance than the demonstration and advocacy of easily observable evidence. Through the selection of specific information, evidence is created to advocate for the inclusion of the innovation in policies. The excellence of the solution is highlighted. The use of the label 'pilot project' contributes to collecting resources. The main mechanism to the realization of EBPM is the promotion of the initiator self-centered evidences.

Despite the distinction in types, a pilot project in water management will often be a mixture thereof, because it is conducted in a multi-actor context. Each of the actors has their own motivations to participate in the pilot project and to influence the initiator.

The roles of the pilot projects for EBPM are:

- Knowledge development and information (either bottom-up or top-down) for research pilot projects
- Promoting communication, cooperation and joint experience for managerial pilot projects
- Promoting self-centered evidences of the initiator for political-entrepreneurial pilot projects

3.2 Pilot project characteristics

Common characteristics of pilot projects are their application in the field, the recognition of the context and the experimental attitudes exercised. To characterize an individual pilot project and to indicate the possible diversity across pilot projects, the study of Vreugdenhil *et al.* (2010) distinguishes between six different pilot project characteristics. These include:

- Scale of application (spatial and temporal)
- Innovation (level, type)
- Knowledge Orientation (level and focus of knowledge creation)
- Special Status (flexibility, additional resources)

- Relation to Policy and Local Context (in policy core or periphery)
- Actor-Network (participation, governance styles)

Characteristics are partly contextually determined and partly designed by initiators and other participating actors. Consequently, a pilot project gets its tailor-made set of characteristics. However, due to biophysical, socio-economic and institutional dynamics, the pilot characteristics will also change over time.

Broadly speaking, a typical set of characteristics of each of the three pilot project types introduced above (Research, Managerial, Political-Entrepreneurial) can be identified. For example, a research pilot project places much emphasis on knowledge orientation through monitoring and analysis. In managerial pilot projects the actor-network characteristic is dominant to facilitate social learning. Political-entrepreneurial pilot projects put strong emphasis on the special status. Research pilot projects usually have less eye for future users and therefore most likely have smaller or less intensive actor involvement than the other types. A managerial pilot is embedded at the core of policies, is moderately innovative, and can be applied at both full scale to resolve an issue or implement policy or at confined scale to reduce risks. The site is fixed and communication is of importance with implementers, users within the site and external actors. A political-entrepreneurial pilot has a strong focus on future users, because initiators understand that the pilot is a means to convince users. However, the initiator can also attempt to keep out other actors to prevent their influence. All three pilot project types make use of the pilot project status, in particular when dependencies for initiation on other actors are understood, but the political-entrepreneurial is most explicit in its use thereof to initiate a pilot project. Given the often hidden intentions in a political-entrepreneurial pilot, their set of characteristics can be highly diverse. This depends on the chosen strategy, which is, however, usually not transparent. The relation between use and characteristics is thus also less clear for this type of pilot. In political-entrepreneurial pilot projects strategic behavior is important. The

pilot project is used to develop a specific type of knowledge that helps to support the actor's case.

In Table 1 an overview is provided of typical characters of the three pilot project types Research, Managerial and Political-Entrepreneurial by using the six pilot project characteristics.

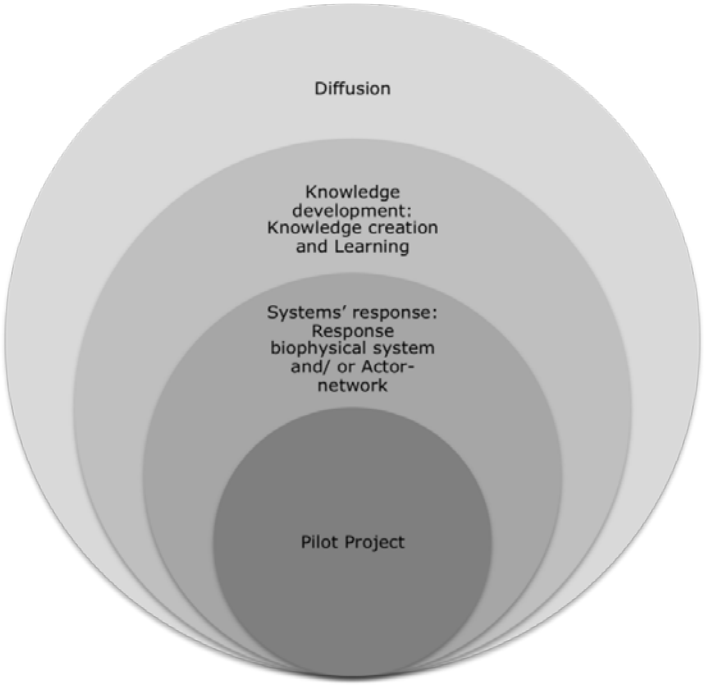
Table 1: Typical characteristics of the three different pilot types

	Research	**Managerial**	**Political-Entrepreneurial**
Scale	Confined	Full or confined	Full or Confined
Innovation	High Supply-driven	Moderate Demand-driven	Low or High Supply-driven
Knowledge Orientation	High Monitoring and Analysis	Low Social learning	Moderate Monitoring and Analysis, Social Learning
Relation to policy and local context	In the periphery	At the core	At core or in the periphery
Actor network	Initiative from research institute Closed	Developers are users Focus on implementers and external actors	Focus on users
Special status	Moderate	Moderate Fixed site	High Deliberate site choice

3.3 Effects of pilot projects

Pilot projects can exert different type of effects, which have an embedded relation (see Figure 1).

Figure 1: Three different types of effects of pilot projects and their embedded relation



The intervention conducted in the pilot project has some impact on its natural and societal environment. An example of a *biophysical system's response* is the change in structure and behavior of a river when in the pilot project a secondary channel is implemented. *Actor-network responses* may include that actors start new co-operations in the installed project teams and actors may enter or leave the network and relationships develop. The *actor-network response* is not only a direct effect of a pilot project, but also reflects the contribution of the pilot project to EBPM because it functions as a mirror of change (Quist 2007; Rogers 2003).

Based on these systems' responses, knowledge can be created and actors may learn. Knowledge development is often claimed as the main goal of pilot projects and provides its legitimacy (Pawson and Tilley 1997). However, the focus and intensity of knowledge development can be diverse due to the design of the pilot project and frames held by participants (Sabatier 1988; Schön and Rein 1994; Bergman and Coxon 2005). The nature of knowledge developed in pilot projects can be described along three dimensions: substantive and process knowledge (Dosi

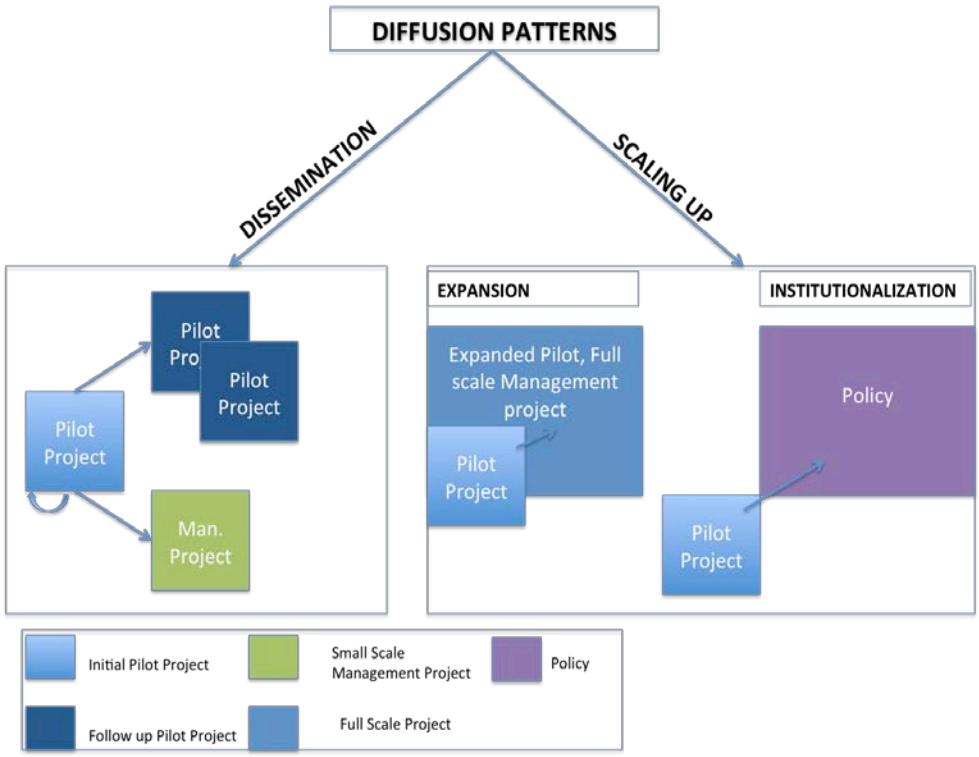
1988), contextual-dependent and generic (Flyvbjerg 2006), and hard and soft (Nonaka and Takeuchi 1995). Hard knowledge refers to quantitative or tangible qualitative information, whereas soft refers to intangible aspects such as values, and relationships between actors. The *knowledge development* provides the basis for the diffusion of the pilot project, including adjustments of policies on the basis of the developed 'evidence'. The level of what is being learned is limited by the quality and quantity of knowledge that is created and by whom it is received and how (Sabatier 1988). Learning in pilot projects goes through rule-based learning, social learning and gaining experience (Dreyfus and Dreyfus 1988; Muro and Jeffrey 2008; Pahl-Wostl 2006; Pahl-Wostl *et al*. 2008).

Diffusion is the third type of effect pilot projects can establish. With diffusion we refer to the spread of the pilot project knowledge to other places and times. Diffusion can be recognized in changed action within the pilot project or in broader management or policies. This is thus a broader meaning of diffusion than exercised in (product) innovation theories (Rogers 2003; Van Mierlo 2002) that focus on the adoption of an innovation. We describe diffusion in terms of their patterns, nature and channels.

Diffusion patterns include *dissemination* and *scaling up* (see Figure 2). "*Dissemination*" refers to the replication of the pilot project at the operational level. The context changes, but the scales and types of issues addressed and level of complexity remain comparable. The stakeholder group also remains comparable (e.g. from farmer to farmer) (Douthwaite *et al*. 2003; Van den Bosch and Rotmans 2008). Dissemination also includes the use of the developed knowledge to improve the innovation or adjust the pilot itself. In *„scaling up"*, the scale dimensions of the pilot project are increased and thus the nature of the problem changes. More actors, interests and administrative layers are included and different biophysical processes start to play a role. Consequently, when scaling up the number of relationships and uncertainties increases and thus the complexity of the problem addressed. More specifically, scaling up includes *expansion* and *institutionalization*. "*Expansion*" means that scale dimensions of the pilot are increased or that full-scale management projects grounded in

the lessons of the pilot are initiated. The diffusion thus remains at the operational level. "*Institutionalization*" implies that regional or national policies and regulations are initiated or adapted based on the pilot project. The knowledge becomes part of the standard practice of governmental bodies. Again, the different scale dimensions (time, space, problem scope) are expanded, but the knowledge is now included in the policy levels.

Figure 2: Diffusion patterns of pilot projects consists of dissemination and scaling up



The nature of what is being diffused can be "narrow" or "broad". With "narrow" diffusion the classical meaning of adoption and use of the innovation is meant (Van Mierlo 2002). This view works for artifacts, but fails to take into account soft or partial aspects of the pilot that can also be diffused. "Broad" diffusion includes next to artifacts also knowledge, both hard and soft, and substantial and procedural. Broad diffusion represents the influence of the developed knowledge on policies and thus illustrates the realization of EBPM with a pilot project. Examples of diffused hard knowledge include knowledge about the design of the innovation and formal institutional structures. Examples of

soft knowledge to be diffused include experience, co-operation, shared values and dilemmas over scarce resources.

Channels of diffusion refer to the actors diffusing a pilot project (Rogers 2003). The channels of diffusion are based on who takes ownership of diffusion. Particularly for soft knowledge this is of importance, because gained experience and social values are embedded in individuals, more than in reports. We identify three types of channels of diffusion. The first type is the *internal channel*. These are actors that experienced the pilot. They expand the pilot or develop new projects. The second type is the *external channel*. This refers to actors not participating in the pilot project but who decided to adopt the concept, independent from the initiators of the pilot project. They have seen and heard about the pilot project and decide to use it. In between these two types of actors we propose a third type of diffusion channel: *internal-external partnership*. The diffusion is promoted by a joint partnership between actors with experience in a pilot and those willing to promote innovation, but external to the pilot.

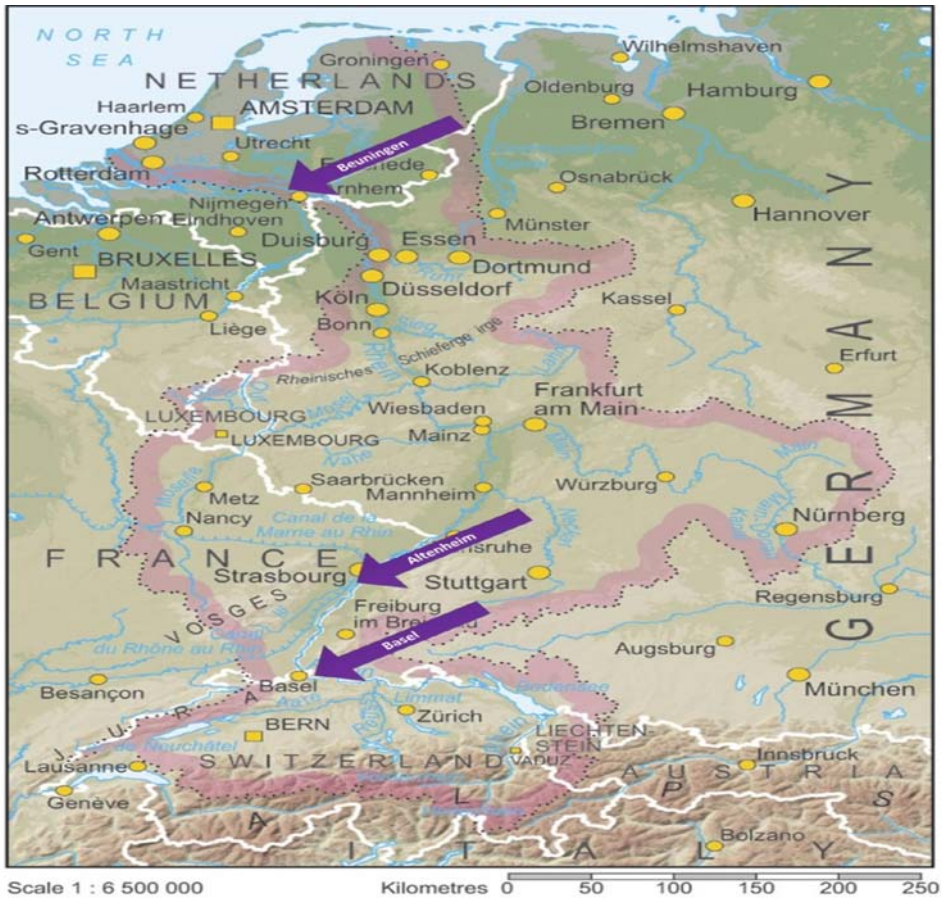
4. Three pilot projects along the River Rhine

We now look at three case studies in the light of the framework presented above to increase our understanding of pilot projects dynamics and their potential role in EBPM. The use of the case studies is to (1) show the broad meaning of the concept 'pilot project' for EBPM, (2) broaden the understanding of different types of contributions pilot projects on policy and management, and (3) elicit different factors that contribute to or hinder the realization of EBPM. We first introduce the case studies and then compare and contrast their characters and effects.

4.1 Introduction to the case studies

The locations of the three studied pilot projects Polder Altenheim, Floodplains of Beuningen and the Stellimatten Floodplains in Basel are depicted in Figure 3.

Figure 3: Map of the Rhine Basin with the location of the three pilot projects indicated (Adapted from UNEP/DEWA/GRID-Europe)



Polder Altenheim

In the pilot project in Polder Altenheim Ecological Floods are tested (see Box 1). Policy-makers intended to include this concept in the policy program of the entire river stretch after it would be approved by the test in the pilot project.

Box 1: Polder Altenheim

Pilot project 1. Polder Altenheim: The introduction of Ecological Floods

Polder Altenheim is a floodplain area in the Rhine Basin in Baden-Wuerttemberg, Germany (see Figure 3). In this section of the Rhine, flood defence levels need to be restored to the level before dams were constructed for hydropower purposes. The policy program 'Integrated Rhine Program' (IRP) has been developed to achieve this (Gewasserdirektion SO/HR 1997). The IRP constitutes amongst 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 and thus not used to floods (Armbruster *et al,* 2006, Siepe 1994). Societal pressure in reaction to the ecological damage 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 by restoring typical abiotic floodplain characteristics and dynamics. This would lead to semi-natural conditions for floodplain habitat development, allowing floodplain species to re-establish and habituate species to the occurrence of floods (Gewässerdirektion SO/HR 2000; Landesanstalt für Umweltschutz 1999). This is done through the synchronization of the inflow of the water in the polder with the Rhine discharges. Polder Altenheim has been used to first test the concept before wider application to all polders in the IRP, thirteen in total.

The pilot project Polder Altenheim was initiated and executed by the river authority. During the process a special interdisciplinary project team (IRP Agentur) was founded to cover all relevant disciplines (e.g. hydrology, ecology, economy). In the pilot project there was a clear focus on knowledge development and learning, represented in an 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. Later, issues related to externalities became of importance as well. The pilot project did bring the biophysical results as hoped for, namely a robust, semi-natural floodplain that can be used for retention without causing major damage to ecology.

The Floodplains of Beuningen

The pilot project conducted in the Floodplains of Beuningen dealt with the concept Cyclic Floodplain Rejuvenation (see Box 2). After the identification of a flood defense problem in 2004, a project team with representatives of Ark, the Radboud university, the river manager and operational arm of the ministry of Transport, Public Works and Water Management (Rijkswaterstaat-RWS) and State Forestry worked together to both resolve the issue and develop evidence on the working of CFR.

Box 2. Floodplains of Beuningen

Pilot project 2. The Floodplains of Beuningen: 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 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 Radboud University as the initiator and leader of the pilot project operated as a facilitator. In close cooperation with ecologists, river engineers and operational managers she designed several measures. Proposals of interventions were discussed in the meetings and checked for feasibility and hydraulic effectiveness by Rijkswaterstaat who functioned as a 'quality controller'. Stichting Ark and State Forestry were more focused on the exact design characteristics such as location within the floodplain and coherence with the ecological system, and practical considerations such as costs, impacts for grazing and accessibility for visitors.

In 2005, an intervention in the form of secondary channels was decided upon 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 nearby planned bridge, so the intervention at this stage is not yet complete.

Basel

The third pilot project studied is the Basel pilot (see Box 3). In this pilot project it is attempted to test the revitalization of the Lange Erlen polder that is in use as a recharge area for drinking water production. The pilot project is initiated by researchers and has initially a strong scientific orientation. During the pilot project, the main project partners start to diverge due to different interpretations of the evidence.

Box 3. The Lange Erlen Floodplains in Basel

Pilot project 3. Basel: Revitalisation of the urban recharge polder 'Lange Erlen'

The Wiese River is a tributary of the Rhine River that runs through Germany and Switzerland. The 'Langen Erlen' floodplains near Basel, Switzerland, are used as infiltration area for the drinking water producer (IWB) and for recreational purposes (Figure 3). 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 floodplains where it can fill up the groundwater table and can subsequently be distracted. This system exists since 1964. Before, the Wiese water was let in. However, Wiese water was of a disputable quality, or at least of high risk of pollution because the discharge is small and waste water treatment plants are located up-stream.

The University of Basel developed 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. The idea was to revitalise this forested section of the floodplain by inundating it with local water instead of Rhine water. This would enhance conditions for ecology and recreation, while drinking water production would not be endangered and costs could be reduced.

The pilot project in Basel was developed in cooperation with the IWB and local governments and ran from 2000-2003. The water producers and the environmental organisations were initially sceptical, but curious, and the other actors (e.g. university, kanton) were positive. In reaction to the pressure for ecological restoration for over 20 years, the IWB provided, as the landowner, an area for testing. The pilot project provided outcomes that were used as evidence both in favour and against the concept. For the one the pilot demonstrated the possibility to combine ecology, economy and recreation, for the other the pilot demonstrated that risks for pollution could not be omitted and thus that the idea did not work.

4.2 Comparing and contrasting the three pilot projects

In this section pilot projects' use, characteristics and effects are compared in order to identify which factors enable or hinder knowledge diffusion into policy and management.

The pilot project characteristics

Table 2 presents a summary of the pilot project characteristics, based on the characteristics introduced in section 3.2, whereby we further distinguish between design dimensions (i.e. how a pilot project has been designed).

Table 2. Set of characteristics of the three pilot projects

Characteristic	**Design Dimension**	**Altenheim**	**Beuningen**	**Basel**
Scale	*Scale limitation*	Confined in time and problem scope	Confined in space time and problem scope	Confined in space, time and problem scope
	Reversible	Yes	No	Yes
Innovation	*Level*	Moderate	Moderate	Radical
	Type	Conceptual	Conceptual	Conceptual
	Driver	Demand-driven	Demand-driven	Supply-driven
Knowledge Orientation	*Knowledge design*	4-year monitoring and analysis program; Biophysical knowledge	Monitoring not included, study instead; Biophysical, institutional, social knowledge	1 year monitoring and analysis; Biophysical and Social knowledge
	Learning design	Formalization of evidence; Conditions for interdisciplinary learning	Formalization of conceptual and process knowledge; Conditions for social learning	Formalization of evidence; Conditions for interdisciplinary learning Joint analysis

(Continued)

Table 2. Set of characteristics of the three pilot projects *(Continued)*

Characteristic	Design Dimension	Altenheim	Beuningen	Basel
Relation to Policy and Local Context	*Position in policy*	In policy core;	In periphery, but fit with paradigm;	In local periphery, but fit with national policy;
	Focus	National	Regional	Local
Status	*Flexibility*	Moderate: hard boundaries for trial and error	Moderate: bounded by playing field	Limited: tight boundaries for trial and error
	Resource allocation	Site, technology, political commitment, Overarching knowledge team	Site, participation, knowledge support	Site, Participation in steering committee, Laboratory support
Actor-Network	*Initiator*	User (Government)	Researchers and initial user (NGO)	Researchers
	Involved actors	Professional interdisciplinary team: users	Project team: Future users, landowners, quality control	Landowner and intended future user, quality controls
	Governance style	Internal: Cooperative External: Informative	Internal: Facilitative- Consultative External: Consultative	Internal: Consultative—Informative External: Informative

The analysis highlights that the Altenheim pilot developed from a research pilot to inform policy-making into a political-entrepreneurial pilot with strong emphasis on advocacy. The pilot initiators reacted in this way to the difficulties arising during implementation and tried to convince citizens who did not agree upon the validity of the evidence for their context. Its initial ap-

plication as early evaluation fit with the EBPM idea of testing a policy at small scale before national roll-out (Cabinet Office 2003). Distinguishing characteristics are the relation to the policy and local context (at the core of the policy), the knowledge orientation (well organized monitoring program) and the actor-network (new established interdisciplinary team). The focus was on professionals only. Internally, a cooperative style and externally, an informative style were exercised.

The Beuningen pilot was initiated as a managerial pilot to resolve the local issue of reduced discharge capacity and as a political-entrepreneurial pilot to advocate the CFR concept with operational managers and regional policy makers. The emphasis shifted over time to the problem solving alone when financial resources were consumed and the initiators became less actively involved. The pilot was confined at all scales and demand driven in the sense that it addressed a direct issue of operational managers. The pilot was not undertaken in direct relation to a policy but did cohere with the line of thinking present in policy programs such as ‘space for the river’ in the Netherlands. Despite its presence in the policy periphery, operational constrains and scale preferences limited the innovativeness of the pilot project. The location was fixed. The pilot lacked a monitoring program, but multiple research initiatives were undertaken in the light of the pilot. In line, the setting for learning was on the design and assumptions, more than on the evidence deriving from the pilot. Social learning was facilitated by the process design and the facilitative governance style that the university, as the project leader, exercised. Each actor brought its own knowledge, from local ecological knowledge to morphological responses of the water system.

The Basel pilot was initiated as scientific research pilot to learn about the concept developed by the university, but it had strong political-entrepreneurial hindered characteristics. Actors already had clear opinions about the concept and the pilot might have helped them to get the issue on or off the agenda. The end-user, i.e. the water company, was very skeptical about the outcome of the project but participated because of the low risk provided by a pilot project. The pilot was built on interdisciplinary research, monitoring was included and a consultative relation ex-

isted with landowners and policy actors. Risks have been eliminated in the pilot by the choice of a small area (0.5 ha.) that is located remotely and knows low production rates. Over time, the pilot developed into a political-entrepreneurial pilot, whereby actors used the pilot to advocate evidence both pro and contra the concept.

Comparing and contrasting the effects of the pilot projects

In section 3.3, Figure 1 introduced the three different types of effects a pilot may have. These were (i) alterations and responses of the biophysical and actor network, (ii) knowledge creation that is subdivided in knowledge creation and learning, and (iii) diffusion that can be described in terms of its pattern, nature and channel. Table 3 below summarizes the different effects of the three pilot projects.

Table 3. Effects of the three pilot projects

Effects	**Sub-categories**	**Altenheim**	**Beuningen**	**Basel**
Alterations and Responses	*Biophysical*	Semi-natural wetland conditions; Changed presence of species; Favorable conditions for retention	Vegetation rejuvenation; Increased in discharge capacity	Semi-natural wetland conditions; Undisturbed drinking water production during pilot
	Actor-Network	Interdisciplinary team established	Temporary collaborative structure of previously opposing actors; Explication of roles	Temporary cooperative structure; Increased distance between actors

(Continued)

Table 3. Effects of the three pilot projects *(Continued)*

Effects	Sub-categories	Altenheim	Beuningen	Basel
Knowledge development	*Knowledge creation*	Flooding schemes; Ecological responses	Handbook for CFR designing	Ecological responses; Methodology; New research; questions
	Learning	Concept-context interactions (e.g. externalities) ; Constructive social learning	Design experience; Concept refined; Constructive social learning	Destructive social learning
Diffusion	*Patterns*	2 Sites implemented; Extension in time and problem scope; Inclusion in policy program	Second pilot project; Included in proposed policy program	Temporary spatial expansion; Partial dissemination to new pilot
	Nature	Concept, Governance structures	Concept, Cooperation, Roles	Simplified concept Quitting contacts
	Channels	Internal, (External)	Internal	Internal

In Altenheim, biophysical responses include the revitalization of the floodplain into an area with semi-natural wetland conditions and the settlement of accompanying species. This provided the conditions for the retention plans. In terms of actor-network responses a multidisciplinary team was installed for the first time in the history of the state. Additionally, forestry activities were reduced, compensation schemes for farmers developed, and future spatial development in the area excluded. Knowledge was

gained on flooding schemes and ecological responses, but also on externalities. Constructive social learning took place, initially particularly between disciplines such as engineering, ecology and with the users and stakeholders within the pilot. Diffusion activities showed the lack of learning with future stakeholders. Diffusion included institutionalization of the concept in the policy program and of the multidisciplinary team into a governmental body, but also the expansion in time of the pilot into a standard management project. After 12 years, two out of thirteen planned sites have been implemented. The implementation process was more challenging than expected. In particular, resistance came from citizens who felt threatened and did not agree with the principles of Ecological Floods (EF i.e. Oekologische Flutungen). Indeed, they considered the Altenheim pilot as not representative for their area and considered EF as a thread to ecology rather than added value (interview with the Burgerinitiative Breisach, a citizens' initiative NGO). Citizens founded organizations, started lawsuits and pressured politicians to explicitly support them. The pilot project thus met the classical idea of EBPM in which the evidence provided by the pilot project provides the reason to include the concept in the policy. One can consider this example as meeting its objective of institutionalization of the policy innovation i.e. scaling up, but implementation in other sites, i.e. dissemination, was not achieved. Overall, diffusion took primarily place within the state and was driven by the initiator. When diffusing to other sites actors changed. Since these actors were not included in the pilot they considered that their concerns were not taken into consideration. As they did not experience the social learning process (participation, value building…), they considered the policy as imposed to them and rejected it.

In Beuningen, implementation has so far been limited to vegetation removal, which has led to an increase in discharge capacity, but not yet to the target. In terms of actor-network response, a new network has been installed of previously opposing actors. The actors could develop their role for the specific problem. Knowledge creation and learning took place on the assumptions underlying the Cyclic Floodplain Rejuvenation (CFR) concept and the process of designing an intervention. Social learning was

constructive i.e. a self-reinforcing cycle of shared learning amongst actors. Diffusion included the transformation of an existing, nearby project (Millingerwaard) into a second CFR pilot (i.e. dissemination). The nature of diffusion includes both the concept and the actor-network cooperation. The channels were primarily internal: the project group transferred the concept to the second pilot and proposed its inclusion in a river management plan (Waal Weelde). Institutionalization has, despite its attempts, not been achieved so far. Consequently, the Beuningen pilot project did not extensively enable the realization of EBPM.

In Basel, the pilot led to semi-natural wetland conditions. Improvements in biodiversity were observed, particularly amphibians benefited from the change in regime. At the same time, the drinking water production process was not affected (Wüthrich and Geissbühler 2002). The actor-network response included the installation of cooperation, but also the increasing distance between actors. Knowledge has been developed on the ecological system, but also on the monitoring system, citizens' acceptance, and new research questions could be formulated. The social learning, however, was of a destructive nature. Despite the initial cooperation in monitoring and analysis, actors did not learn to understand each other, conflicts on values arose and their working relations stopped. They held different expectations and started to distrust each other even more. While the IWB was blamed for being conservative, the university was blamed for being a partial environmentalist advocate. Citizens generally supported the project and consequent changes in the landscape (Knall 2006). The nature of diffusion was on revitalization floodplains. However, the combination of revitalization with drinking water production, which was the innovative aspect, was dropped-off. Diffusion could also be recognized in the appearance of the environmental issue on the political agenda. Politics was forced to choose side, which they did in favor of the IWB that had a long standing reputation and a vital function. Initial explorations with the upstream (German) towns were made about the wastewater treatment plants. The role of this pilot project in realizing EBPM consisted in getting related issues on the agenda. Temporarily diffusion took place as the scale of the pilot was ex-

panded. However, since cooperation between key actors stopped and the nature of the problem addressed changed one might question to what extent EBPM was actually realized. Indeed, depending on which stance of evidence one follows, EBPM has been realized or not. This case thus provides an outspoken example of the different roles of pilot projects in realizing EBPM and the importance of actors' stance in perceiving a pilot as a success or as a failure.

5 Implications for EBPM

The case studies provided different examples of the role of pilot projects in EBPM. In this section we discuss the roles of the different projects in realizing EBPM and which factors benefit or limit this. Based on the insights developed we also propose some suggestions of how to foster the realization of EBMP through pilot projects.

5.1 Different roles of pilot projects for realizing EBPM

As indicated, of the three studied pilot projects, the Altenheim project was most in line with the understanding of EBPM, in which a formulated policy is first tested at a small scale and enriched by grounded evidences prior to the roll-out of the policy (Cabinet Office 2003, HM Treasury GSRU 2007). For this case this meant that the new concept was first implemented in one of the thirteen indicated areas. The pilot initially fulfilled the promise of delivering positive evidence based on which the policy program was approved. However, the case study also demonstrated that when implementing the policy, evidence got a different meaning. The representativeness of the evidence for other individual area was not studied. Instead, evidence was used at a more generic level than studied in the pilot project, in which one learns about the application of the concept in a specific context (design, area actors). When diffusing, evidences appeared to have different meanings for different actors. Indeed, they selected and highlighted evidences to promote their own agenda and values. They did not trust each other's interpretations of evidences.

The other two cases show that pilot projects can contribute to EBPM in different ways than solely early evaluation. Indeed, as research pilot project they provided bottom-up evidences to policy-makers as pointed out by Solesbury (2001). Additionally, the pilot projects emphasized the importance of actors' participation for diffusion (the internal channels) and thus for gaining trust in evidence. Despite the initial focus on problem solving rather than on the development of evidence, pilot projects still contribute to the realization of EBPM through actors' participation and social learning. Furthermore, the case studies demonstrate that evidences are social constructs and as such can be used differently to develop diverging arguments of conflicting actors. Evidences cannot be taken as objective facts. This reinforces previous findings on conflict potentially arising from diverging interpretations on how to meet the objectives of the EU Water Framework Directive (Ker Rault and Jeffrey 2008).

Lastly, even when the pilot project ends in conflict over the interpretation of evidences such as in Basel, the pilot can still influence policy-making. The issue came on the political agenda, the relative power of actors became clear and the policy-makers took decisions based on their own interpretation and values.

5.2 Insights in the meaning of 'evidence' developed in pilot projects

What constitutes evidence is broadly discussed in EBPM literature (e.g. Head 2008; Nutley *et al.* 2003; Nutley *et al.* 2007; Armstrong *et al.* 2007). This study on pilot projects contributes to this discussion by the following observations:

- Evidence has different appearances. All pilots contribute to the development of knowledge. This knowledge can be about the innovation (Altenheim, Basel, Beuningen), institutions (Altenheim, Beuningen), methodologies (Basel), the ecosystem and actors and particularly about the interactions between all of these elements (Altenheim, Basel, Beuningen). The knowledge provides the hard and soft evidence, based on which it can be decided to further use, reject or improve the innovation.

- Anticipated evidences are put forward to justify the diffusion of the pilot before the actual evidences are elicited. This is associated to strong trust and shared values between the participants and the reliance on other sources of information. In the Beuningen project, trust was built with the help of scientific research and existing examples of comparable measures.
- Perceptions of evidences influence diffusion. Different actors perceive evidence differently (Head 2008). In the example of the Basel case, scientists had different interpretation than policy-makers. Based on their own interpretations each took different decisions for diffusion (advocate dissemination versus cancelling follow up).

5.3 Factors hindering or encouraging the realization of EBPM

The three cases did contribute to the realization of EBPM in different ways. However, the extent thereof was not as much as desired by the initiators. Some of the factors hindering or encouraging the realization of EBPM observed in the case studies include:

- *Governance styles.* The governance styles exercised in the pilot foster the acceptance of evidence. Through open governance styles, shared perceptions of the problem and evidence can be built upon. Methods and interpretation of results are agreed upon. Important is that governance styles are not only intended but also perceived as open. Closed governance styles in contrast, enable the pilot initiators to focus on specific research questions, but limit constructive social learning.
- *Actor involvement.* The involvement of actors highly influences who learns what, which knowledge is available to the pilot and what the focus of evidence development is. Involved actors are introduced to the innovation, learn to know other actors at a professional and personal level, develop enthusiasm or aversion for the innovation and gain experience in designing and implementation. This knowledge, which is both of a hard and a soft nature, fosters decisions to continue or to stop with the innovation. Additionally, they can use their experience for new projects.

- *Nature of the initiator.* Evidence was relatively easily accepted when the user, policy-maker and pilot developer were the same actor. At the same time this embedded position of the initiator poses a risk to remain critical to the evidence. Moreover, non-policy initiators had more freedom to apply radical innovations.
- *Inadequate diffusion strategies.* Initiators may not be aware from the start of the role they have in realizing EBPM and therefore do not prepare activities for diffusion. Problems arose in the absence of resources available for longer-term support of diffusion, when actors were waiting for hard evidence to be developed before sharing knowledge, or when actors had a single-sided focus on institutionalization or dissemination only.

5.4 Insights on some strategies for realizing EBPM

Based on the above, we formulate some strategies for pilot project initiators striving after EBPM. Due to the complex nature of policy-making, the extent to which the strategies are effective can of course not be foreseen. Moreover, pilot project initiators are often posed for dilemmas and paradoxes such as the institutionalization paradox. Institutionalization is needed for safeguarding the innovation at the long term, but at the same time may reduce the flexibility that characterized the pilot project. This may hinder implementation. Some strategies include:

- Exercise open governance style to foster social learning in such a way that participants also perceive it as such.
- Think about future key stakeholders for diffusion during the pilot project.
- Include diffusion activities in the project proposal and reserve resources for their realization.
- Strive after both institutionalization and dissemination. It is the combination that enables long-term protection and implementation in practice.
- Prepare actors owning critical resources for further diffusion decisions to prevent negative surprises.

6. Conclusion

Pilot projects have an important position in EBPM. In this paper we discussed which type of pilot projects can play a role in realizing EBPM and which factors influence this process.

We identified three different types of pilot projects, including *research*, *managerial* and *political-entrepreneurial* pilot projects. The effects of pilot projects include the response of the biophysical- and actor-network system, knowledge development and diffusion thereof. The latter relates directly to the realization of EBPM. Diffusion represents which knowledge is adopted as evidence in policy development, both at the institutional and at the operational level.

Each of the pilot project types contributes to realizing EBPM in a different way. Research pilot projects either provide research-induced findings on a particular innovation that are provided to policy makers ('bottom-up'), or they provide direct information of the working of a policy requested by policy-makers ('top-down'), based on which policy-makers can develop, adjust, or reject policies. Managerial pilot projects are initiated to resolve local issues or to implement policies in innovative ways and are characterized by pragmatism. Policy-makers learn by participating. They can use their experience for ongoing policy-development and decisions to be made. In political-entrepreneurial a particular innovation is central. The initiators explicitly attempt to 'sell' their innovation. Through a pilot project they build the evidence to support their case. The knowledge is diffused to policy-makers through the use of the pilot as an example and through participation.

To enhance the realization of EBPM, characteristics of all three pilot project types should be used:

- Development of 'hard' knowledge as evidence (research pilot),
- Facilitation of social learning through open governance styles (managerial pilot),
- The role of initiators as ambassadors of the ideas once evidence is developed (political-entrepreneurial pilot).

Pilot projects are both a means to develop and to transfer evidence through experience. Indeed, during process design, actors

critical to both the pilot and its diffusion need to be identified and involved from an early stage. Pitfalls of each of the pilot project types are the single-sided focus on hard knowledge, the lack of connection with other actors (research pilot), lack of freedom in innovating (managerial) and being pre-determined and so a lack of openness to learn from the start (political-entrepreneurial). A general pitfall is the focus on institutionalization only. Dissemination of pilot projects is inherently difficult due to the presence of new actors in new areas. The learning process needs to be re-initiated.

Acknowledgements

This research has been conducted in the framework of the Multi-Actor-Systems research of Delft University of Technology. We would like to thank the anonymous reviewers, Kathrin Frey and Simone Ledermann for their constructive comments on earlier versions of this paper.

References

Armbruster, J., Muley-Fritze, A., Pfarr, U., Rhodius, R., Siepmann-Schinker, D., Sittler, B. et al. (2006). FOWARA: Forested Water Retention Areas. Guideline for decision-makers, forest managers and land owners. Bühl, Germany.

Armstrong, R., Waters, E., Crockett, B., Keleher, H. (2007). The nature of evidence resources and knowledge translation for health promotion practitioners. Health Promotion International 22 (3), 254-260.

Baptist, M. J., Smits, A.J.M., Duel, H, Lee van der G.E.M., Geerling, G.J., Penning, W.E., Alphen van, J.S.L. (2004). Cyclische Verjonging van Uiterwaarden. Een hoogwater- en natuurbeheersstrategie gemodelleerd. Landschap 21 (1), 15-26.

Bergman, M. and Coxon, A. (2005). The quality in qualitative methods. Forum Qualitative Social Research 6(2), Art. 34.

Retrieved March 28, 2010 fromhttp://www.qualitative-research.net/fqs-texte/2-05/05-2-34-e.htm.

Cabinet Office (1999). Professional Policy-Making for the Twenty-First Century. Retrieved March 28, 2010 fromhttp://www.civilservant.org.uk/profpolicymaking.pdf

Cabinet Office (2003). Trying It Out, The Role of 'Pilots' in Policy-Making: Report of a Review of Government Pilots. City University, London, UK

De Groen, J., Potze, A., de Jonge, B., Rutjens, J. (2004). Innovatie van de overheid: Een Buitenkans. Positionering van de afdeling Strategie en Innovatie. Den Haag, NSOB. (in Dutch).

Dosi, G. (1988). Technical Change and Economic Theory. Burns and Oates.

Douthwaite, Kuby, T., Van de Fliert, E., Schulz S. (2003). Impact pathway evaluation: an approach for achieving and attributing impact in complex systems. Agricultural Systems 78, 243-265.

Dreyfus, H., and Dreyfus, S. (1988). Mind over Machine: the Power of Human Intuition and Expertise in the Era of the Computer. Free Press, New York, USA.

Flyvbjerg, B. (2006). Five misunderstandings about case study research. Qualitative Inquiry 12(2), 219-245.

Gewässerdirektion, SO/ HR (1997). The Integrated Rhine Programm - Flood control and restoration of former flood plains on the Upper Rhine. G. Klaiber, Pharr, U., Kuhn, S. Lahr, State of Baden-Wuerttemberg, Germany.

Gewässerdirektion, SO/ HR. (2000). Gesamtkonzept ökologische Flutungen im Integrierten Rheinprogram. Materialen zum Integrierten Rheinprogramm Band 11. U. Pfarr, Temporäre Arbeitsgruppe 'ökologische Flutungen'. Lahr, Baden-Württemberg.

Head, B. (2008). Three Lenses of Evidence-Based Policy. Australian Journal of Public Administration 67(1), 1-11.

HM Treasury, Government Social Research Unit (2007). Analysis for Policy: Evidence-Based Policy in Practice. Retrieved March 28, 2010 fromhttp://www.gsr.gov.uk.

Huitema, D., E. Mostert, W. Egas, S. Moellenkamp, C. Pahl-Wostl, and R. Yalcin. (2009). Adaptive water governance; Assessing adaptive management from an institutional perspective. Ecology and Society 14 (26).

Ker Rault, P. A. (2008). Public Participation in Integrated Water Management: a Wicked Concept for a Complex Societal Problem. Dissertation, Cranfield University, UK

Ker Rault, P.A., and Jeffrey, P. (2008). Deconstructing public participation in the Water Framework Directive: implementation and compliance with the letter or with the spirit of the law? Water and Environment Journal 22 (4), 24-249.

Knall, J. (2006). Akzeptanz durch Mitwirkung? Das Beispiel Auenrevitalisierung.Eine räumlich orientierte Wirkungsanalyse des partizipativen Ansatzes im transdisziplinären Naturschutzprojekt „Stellimatten“. Physiogeographica. Basel, University of Basel: 220.

Landesanstalt fur Umweltschutz (1999). Auswirkungen der ökologischen Flutungen der Polder Altenheim. Ergebnisse des Untersuchungsprogramm 1993-1996. Materialen zum Integrierten Rheinprogramm Band 9. S. O. H. Gewasserdirektion. Karlsruhe, Germany.

Muro, M., and Jeffrey, P. (2008). A critical review of the theory and application of social learning in participatory natural resource management processes. Journal of Environmental Planning and Management 51(3), 325.

Nonaka, I. and Takeuchi, H. (1995). The knowledge creating company. New York: Oxford University Press

Nutley, S., Walter, I. and Davies, H. (2003). From Knowing to Doing: A Framework for Understanding the Evidence-into-Practice Agenda, Evaluation 9 (2), 125-48.

Nutley, S., Walter, I., and Davies, H. (2007). Using Evidence. How research can inform public services. Bristol: The Policy Press.

Pahl-Worst, C. (2006). The importance of social learning in restoring the multifunctionality of rivers and floodplains. Ecology and Society 11(1), 10.

Pahl-Worst, C., Tabara, D., Bowen, R., Craps, M., Dewulf, A., Mostert, E., Riffer, D., and Taillieu, T., (2008). The importance of social learning and culture for sustainable water management. Ecological Economics. 64, 484-495.

Pawson R., and N. Tilley (1997). Realistic Evaluation. London, Sage Publications.

Peters, B., Kater, E., Geerling, G. (2006). Cyclisch Beheer in Uiterwaarden. Natuur en veiligheid in de praktijk. Nijmegen.

Quist, J. (2007). Backcasting for a sustainable future. The impact after ten years. PhD Thesis, Delft University of Technology, The Netherlands.

Rogers, E. (2003). Diffusion of Innovation. New York, The Free Press, 5th edition.

Rüetschi, D. (2004). Basler Trinkwassergewinnung in den Langen-Erlen—Biologische Reinigungsleistungen in den bewaldeten Wässerstellen, Physiogeographica 34 (in German).

Sabatier, P. A. (1988). An advocacy coalition framewrok of policy change and the role of policy-oriented learning therein. Policy sciences 21, 129-168.

Sanderson, I. (2002). Evaluation, Policy learning and Evidence based policy making. Public Administration 80 (1).

Sanderson, I. (2003). Is it ‘what works’ that matters? Evaluation and Evidence based policy making. Research Papers in Education, 18 (4), 331-345.

Schön, D. and Rein, M. (1994). Frame reflection. Toward the resolution of intractable policy controversies. New York, Basic Books.

Siepe A. (1994). Regeneration of flood plain biotopes on the Upper Rhine—the 'Polder Altenheim' case. In: Rehabilitation of the River Rhine (Ed. J.A. van der Kraats). Water Science and Technology 29, 281-288.

Smits, A. J. M., Havinga, H., Marteijn, E.C.L. (2000). New concepts in river and water management in the Rhine river basin: how to live with the unexpected? In: A. J. M. Smits, Nienhuis, P.H., Leuven, R.S.E.W. (eds) New approaches to river management, Leiden, The Netherlands.

Solesbury, W. (2001). Evidence Based Policy: Whence it Came and Where it's Going. London: ESRC UK Centre for Evidence Based Policy and Practice. Retrieved March 28, 2010 fromhttp://www.kcl.ac.uk/content/1/c6/03/45/84/wp1.pdf.

Van den Bosch, S., and Rotmans, J., (2008). Deepening, Broadening and Scaling up: towards a Conceptual Framework for Transition Experiments. Rotterdam.

Van Mierlo, B. (2002). Kiem van maatschappelijke verandering: Verspreiding van zonnecelsystemen in de woningbouw met behulp van pilotprojecten. Aksant. Amsterdam, Universiteit van Amsterdam: 324. (in Dutch).

Vreugdenhil, H., Taljaard, S., Frantzeskaki, N., Slinger, J., Ker Rault. P. (2009). The next step in policy transitions: Diffusion of pilot projects. 13th Annual Conference of the International Research Society for Public Management (IRSPM XIII) April 6th—8th, 2009, Copenhagen Business School, Copenhagen, Denmark.

Vreugdenhil, H., and Slinger, J.H. (2009). Cross-Comparing Three Pilot Projects in the Rhine Basin. Proceedings of the 7th International Science Conference on the Human Dimensions of Global Environmental Change, 26-30 april 2009. Bonn, Germany.

Vreugdenhil, H., Slinger, J.H., Thissen W., and Ker Rault P.A. (2010). Pilot projects in water management. Ecology and Society 15 (3).

Vreugdenhil, H., Slinger, J.H., Kater, E., Thissen, W. (2010b). The Influence of Scale Preferences on the Design of a Water Innovation: A Case in Dutch River Management. Environmental Management 46(1), 29-43. Retrieved March 28, 2010 from http://www.springerlink.com/content/q684357605212537/.

Walters, C. (1997). Challenges in adaptive management of riparian and coastal ecosystems. Conservation Ecology 1(2)

Wüthrich, C., Geissbühler, U., Rüetschi, D. (2001). Revitalisierung und Trinkwasserschutz in der dicht genutzten Wiese-Ebene. Feuchtgebiete als Reinigungsstufe. Regio Basiliensis 42(1), 97-116 (in German).

Wüthrich, C., Geissbühler, U., (2002). Auenrevitalisierung in einer städtischen Grundwasserschutzzone. Probleme und Chancen transdisziplinärer Forschung. Regio Basiliensis 43(1), 29-41. (in German).