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Experiences with restoration of inland freshwater wetlands in the Netherlands: lessons for science and policy-making

Hasse Goosen · Pier Vellinga

Abstract The past decade has seen important changes in the approach to water management issues in the Netherlands. Urban development, recreational demands, agriculture, nature conservation and other space demanding functions compete with water management objectives in their claims for space. An analysis of some recent water management projects illustrates that the implementation of “the new water management approach” is not always easy. Catchment-based multifunctional projects encounter major constraints. These constraints are: 1) national goals versus local constraints; 2) limited sense of urgency; 3) lack of institutional coordination in the water management community; 4) unclear views over nature conservation, and; 5) limited understanding of wetland functioning in relation to flood risk management. We promote platforms for collaborative planning as a way to improve stakeholder participation in early stages of decision-making. Negotiation and mediation support tools can enable stakeholders and mediators to formulate the problems that need to be addressed more effectively. Early involvement of stakeholders in the planning process is almost a condition for successful implementation; however, it is no guarantee of success, and not all conflicts can be solved. Therefore assessment of the costs and benefits of different parties is important for compensation schemes to gain broad social acceptance.

Keywords Water management · Netherlands · Wetland restoration · Negotiation

Introduction

The freshwater wetlands in the Netherlands have been strongly affected by the intensification of agriculture, drinking water abstraction, and economic development (urban development and infrastructure). Since the adoption of the Dutch Nature Policy Plan (NPPN) in 1989, the attention being paid to protection and restoration of wetland ecosystems has been increasing. The aim of this article is to highlight some constraints encountered in wetland restoration projects. Awareness of these issues may help future planning, but we also identify opportunities for improvement.

This article first places wetland restoration in the context of current issues in nature and water management, spatial planning and societal change. Next, the results of an exploratory study into the current practical experiences with wetland restoration in the Netherlands are presented. Finally, we will discuss what we have learned from studying the practical examples, and how integrated models can be tailored to better support the planning and implementation process of wetland restoration projects.

The policy context of wetland restoration

Nature management

Inland freshwater wetlands have been strongly affected by the manipulation of groundwater tables (Barendrecht et al 1993; Witmer 1989). Lowering of groundwater tables increases agricultural production but also leads to mineralisation of the upper peat layers and subsidence of the land. The well-drained agricultural areas have become depressions in the landscape, often surrounded by more elevated lakes and wetlands. As a result, groundwater in the higher more natural areas percolates into the surrounding lower-lying polders from where it is drained by a complex system of small ditches, canals and pumps. Inlets of water from the River Rhine and Lake IJsselmeer into the lakes and wetlands are necessary to compensate for the loss of water. Unfortunately, this incoming water is contaminated with nutrients and pesticides. Raising water tables in the agricultural polders could reduce seepage

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from the wetlands and so reduce the need for supplementation with polluted water.

Wetland restoration is supported by the National Policy Plan for Nature (NPPN) (Ministry of Agriculture, Nature Management and Fisheries 1989). Apart from improving the water quality in wetlands, much attention is being given to establishing corridors. Many wetland systems have been subject to fragmentation, and an important feature in nature conservation policy is the establishment of a national nature-infrastructure ("Ecologische Hoofdstructuur").

Integrated water management and global change

Without dykes and dunes, more than half the area of the Netherlands would be permanently or regularly inundated. For centuries, building dykes and developing drainage systems has been the main strategy for flood protection. The hydrological system has become strongly regulated and vulnerable to changes, such as sea level rises. The rise in sea levels is expected to accelerate from the current rate of 18 cm/100 yr up to 20–100 cm over the next century; the likely effect of global warming (Können 1999). Global warming is also expected to increase the intensity of precipitation and peak river discharge in winter, as well as lower rainfall and glacial water supply in summer. At the same time, the land continues to subside. This is partly caused by the drainage of polders for agricultural purposes. Land subsidence is presently highest in peat areas. In some of these peat polders, subsidence rates are as high as 1 m/100 yr. As a result of this human-induced subsidence, ground levels in a large number of Dutch peat areas are now several metres below sea level. Subsidence, in combination with climate change and rising sea levels, will increase the risk of flooding. Safeguarding people, urban areas and the polders from unacceptable flooding risks will require a major overhaul of the Netherlands' water management system. Recently this was stressed by the Rathenau institute in a message to Parliament (Rathenau Institute 2001) and by the Commission on Integrated Water Management in the 21st Century (2000).

Water management in the Netherlands therefore faces new challenges. Partly inspired by these challenges, and partly inspired by social preferences, there has been a shift in current thinking about water management options: from a water defence approach, to a water buffering approach. Integrated water management (simultaneous management of water, space and nature) has become a key feature in national water management policy (Ministry of Transport and Water Management 1999).

For the rivers, the focus has moved from getting rid of surpluses to exploring water conservation and buffering opportunities. Throughout catchments, the flow area of rivers, their storage capacity, and the capacity of adjacent polders are being enlarged in preference to embarking on a further round of dyke strengthening (Kwakernaak et al 1996; W.L. Delft and Bureau Strooming 1999; Helmer et al 1996). Where the coast is concerned, it implies increasing coastal resilience through nature restoration, in combination with the creation of inundation zones and extensive

sand nourishment instead of "hard" engineering structures (Klein et al 1998; Helmer et al 1996).

For the peat areas in the lower parts of the Netherlands, higher water tables are being allowed in some parts, not only to counteract the ongoing land subsidence and wetland deterioration, but also to act as storage basins for surplus water and to offer opportunities for recreation. In this way, wetland restoration can contribute to both the ecological and societal system.

Spatial planning and socio-economic change

The Netherlands is a densely populated country where economic growth, population growth and changing social preferences increase the demand for space. Residential development, infrastructure, nature and recreation claim the already scarce space. On the other hand, more land is becoming available for non-agricultural land-uses as globalisation and the reduction of EU subsidies make agriculture less profitable. Furthermore, sea level rises, increasing precipitation, run-off, and land subsidence will likely lead to growing costs associated with the drainage of agricultural land, especially in the deeper polders in the peat area (Ministry of Agriculture, Nature Management and Fisheries 1999).

The agricultural land which may become available for other uses will be claimed by many parties: urban development, recreation and nature conservation, and nature development. Pro-active spatial planning is a way to deal with the various claims. There is growing awareness that these issues should not be dealt with on a local basis, but rather should be managed at a catchment level, which emphasises the importance of an integrated, spatial approach. Water is of growing importance in spatial planning policy and it has a prominent role in the 5th National Report on Spatial Planning (MHE 2001). It is however questionable whether the spatial planning and water management institutions are capable of realising a true catchment-based integrated approach. Over 650 institutions and agents are involved in water management, and the co-operation between these parties is far from optimal (NRLO, AWT, RMNO 2000). It is of particular importance that the communication and co-operation between different institutional levels is improved.

Nation-wide strategies for water management and spatial planning are often in conflict with local objectives, and therefore interaction between the different institutional layers is essential. As an example, the emphasis in the recent advice from the Commission on Integrated Water Management in the 21st Century (2000) is on designating areas for water storage and buffering rather than reinforcing the dykes and drainage systems. However, the water boards operating at the local scale are responsible for maintaining the level of safety, according to the so-called "Delta Law" and therefore dyke reinforcements may be required. Moreover, water storage and buffering may have considerable economic consequences (loss of agricultural production, higher costs). This shows that decision makers at the local level will have to deal with issues that are not always apparent at the provincial or national

level. Communication and co-operation between the different institutional levels is therefore essential.

Wetland restoration in the Netherlands: current status

This section analyses the progress made from conceptual thinking and policy planning (see above) to practical implementation. It discusses the results of an exploratory study into some current practical experiences with wetland restoration in the Netherlands. An inventory of restoration projects was made through literature and Internet searches and through a series of interviews with representatives of nature protection agencies and governmental agencies. The goal of this inventory was: 1) to determine whether the increased attention for wetland restoration and development over the past decade has led to concrete actions; 2) to gain insight into the opportunities and constraints associated with the planning and implementation of projects. We present a number of initiatives here, and try to identify useful lessons for planners, policy makers and scientists in the field. The inventory presents one instantaneous moment in time, and is not (and not intended) to be all-inclusive. The various projects are grouped according to the dominant function they support. Figure 1 shows the locations of the various wetland projects within the Netherlands.

Nature restoration projects

De Venen

Project "De Venen" (see Fig. 1) aims to develop new wetlands in the area between Amsterdam and Utrecht. The project was initiated in 1992 by the largest Dutch nature conservation organisation, Natuurmonumenten. The goal

of the project is to connect the various wetlands in the area and to create a coherent and sizeable wetland area of international importance.

Wetlands in the Vecht area

The Vecht area (see Fig. 1) is one of the largest wetland complexes in the Netherlands. It is not a fully natural area but the result of many years of human intervention via peat-cutting and extensive agriculture. The area comprises shallow lakes and fens interspersed with agricultural fields and villages. Polders with low water tables and supporting agriculture surround areas with a high nature conservation value (see also Gilbert et al, this issue). Water seeps from the wetlands into the adjacent agricultural polders. Contaminated surface water from the River Vecht and Lake IJsselmeer has been used to maintain water levels in the wetlands, but reduces their quality and functioning.

To counteract this process, areas surrounding wetland areas are being claimed for nature development. In these areas, less water is drained and water tables are allowed to rise. Not only does this reduce water stress in the wetlands and penetration of low-quality water in existing wetlands, it also increases the opportunities for nature restoration. Examples are the raised water levels in the Horstermeer and the areas surrounding Lake Naardermeer.

De Wieden

A similar situation exists in another large wetland complex, "De Wieden" (see Fig. 1). In 1989–1990, an area of approximately 150 ha was designated as a buffering zone separating the wetlands from the surrounding polders. As a consequence, less water flows to the surrounding agricultural area, leading to a decreased need for the inlet of river water. The project has been a success and the area now offers a valuable habitat, especially for many bird species.

Fig. 1
Location of some wetland restoration projects in the Netherlands

Wetlands for recreational development

The Blue Network project (Fig. 1) aimed to establish a network of rivers and channels to connect the central open area of the Netherlands (the Green Hart) to surrounding cities. This network would increase the opportunities for water recreation. The network was to be connected to existing recreational areas in such a way that boats could travel to and through the area from different parts of the Netherlands.

“Twiske” and “Delftse Hout” (Fig. 1) are examples of areas where nature, water and recreation have been combined. Both areas were developed in the 1970s to provide the inhabitants of nearby cities with the opportunity to recreate in a natural environment. Careful planning of activities has resulted in a separation of activities within the areas. There are relatively quiet undisturbed areas for nature seekers and there are beaches and various facilities for those seeking recreation. The “Alkeet-Foppenspolder” (see Fig. 1) is a similar area located near the city of Rotterdam. Here agricultural land has recently been transformed into a wetland area designed for nature and recreation.

Wetlands for flood prevention

Examples of the development of wetlands for flood prevention are found in Groningen in the north-east of the Netherlands. The project “Wolfsbarge” (see Fig. 1) aims to restore the water storage capacity of the wetlands in the River Hunze catchment area.

In the Province of North-Holland, the district water board has investigated the option of developing a wetland for flood prevention. A polder will be designated for the intake of surplus water in periods of increased risks of floods. The advantage of this option is that the planned increase in capacity of the pumping-engines (for water drainage) is no longer necessary and, in addition, a nature area can be developed. The Province of North-Holland will make the final decision.

Artificial wetlands in urban areas

In urban areas, rainwater is discharged quickly by efficient storm water systems. Artificial wetlands could make the urban area less dependent on neighbouring systems or resources for the supply and discharge of water (Tjallingii 1993). Surplus run-off water from urban areas can be collected in these artificial wetlands for water purification. In this way, water is collected in wetland areas and therefore not quickly discharged by the storm water system. This water, although of inferior quality, can be used for many purposes (irrigation, industrial water, “grey water” for households – toilets, gardens). A number of cities in the Netherlands have experience with artificial wetlands (Breda, Nijmegen, Amstelveen), and in new residential areas the ideas are being applied more commonly. In the province of Groningen, in the north-east of the Netherlands, a large project is planned aimed at integrating residential development with wetland development for nature and recreation. The “Blue City” aims to establish a large wetland area around which a new city will arise. The wetland should offer attractive surroundings for the future

inhabitants and should stimulate opportunities for recreation.

The plan facilitates 1200–1800 dwellings integrated in the wetland area. Recreational facilities are planned and some areas are separated from activities to stimulate the ecological development. The project was initiated in 1994, and in November 2001 the construction work actually started. The planning procedure was led by a separate organisation financially supported by governmental organisations.

Opportunities and constraints

The practical examples mentioned in the previous section have been studied in more detail to identify the opportunities and constraints associated with the implementation of integrated water management. Most projects encountered similar problems that we will briefly describe in this section. From these problems useful lessons can be learned for both policy makers and scientists.

National goals versus local constraints

Wetland restoration projects are often faced with strong resistance from local stakeholders. Local inhabitants fear the possible problems associated with higher groundwater levels, increased risk of floods, and nuisance caused by mosquitoes. Furthermore, wetland restoration requires a change in land use. In general, agricultural land is transformed into nature and this implies changes in economic and emotional values, raising political conflicts. For instance, in project “De Venen”, an area of about 2500 ha will be converted from agriculture to wetland area. This has proven to be a costly and time-consuming process, requiring careful planning and preparation. Local stakeholders and inhabitants of the area were not actively included in the early stages of the planning process. Farmers were not willing to sell their land, and could not see the importance of nature development in the area. In their view, the agricultural land already holds important ecological and aesthetic values. Furthermore, the inhabitants and farmers fear negative impacts from increasing water damage, and growing numbers of insects. Although significant progress has been made, the total area now under implementation is smaller than anticipated. The acquisition of the land for nature restoration has been a long and costly process for the wetland restoration projects in the Vechtstreek. Raising water levels is in conflict with current land use, and again inhabitants and farmers fear negative impacts from the hydrological measures.

Limited sense of urgency

Wetland restoration can contribute to the solution of a number of problems that will occur in the *long term*. Climate change, loss of biodiversity, and also the socio-economic changes that cause land-use conflicts are processes that occur at slow rates. Consequently there is no sense of urgency to undertake immediate action. In cases where there is a direct need for action (for instance the floods of 1993 and 1995), short-term measures are taken, such as

reinforcing dykes. Therefore, not only is there a mismatch between the spatial scale levels of costs and benefits, but temporal scales of project initiators differ from those of local stakeholders. At local scales, stakeholders are tempted to support short-term solutions, whereas national policy-makers (water managers) push for long-term sustainable solutions. Communication and active stakeholder participation in open plan processes can again help to increase mutual understanding of goals and preferences, as was pointed out in the previous section.

Lack of institutional coordination

There is not one ministry or department that deals specifically with wetlands. Nature conservation aspects are a matter for the Ministry of Agriculture, Nature Management and Fisheries. Flood prevention and water quality are the responsibility of the Ministry of Transport, Public Works and Water Management. Spatial planning and urban development falls under the Ministry of Housing, Spatial Planning and the Environment. Local government has the major share of the jurisdiction over land use. Consequently, there is not a natural lead partner to take the initiative for integrating projects. The “Blue Network” project is a good example of a project that has failed because no governmental party took the responsibility for its organisation. The project lacked the necessary financial support and has until now been unsuccessful. Traditionally, water management boards were responsible for the management of water levels, with the main focus on serving agricultural production. The management of water levels has now become more complex. Water provides different functions for various actors, such as for consumption, waste treatment, natural conservation and recreation. Furthermore, the quantity of water can be too high (flooding) or too low (salinization and droughts). This increase in complexity of the water management issue has raised the question of whether the water management boards are still capable of dealing with water management issues. The Rathenau Institute (an independent advisory board to the Dutch government) promoted the role of the provincial governments in the coordination of regional water management and planning (Rathenau Institute 2001).

Unclear views over nature conservation

In many projects, there is no general consensus on what the targets for nature should be. Some argue that the current landscape, which is strongly influenced by agriculture, deserves to be protected because of its cultural and historical values and its importance for a large number of bird species. Others emphasise the importance of natural processes and dynamics and favour creating extensive wetlands with room for natural processes. This is a discussion between scientists, conservationists and policy makers. The small-scale agricultural landscape contains natural and cultural-historical values, and the restoration of natural processes in the wetlands will change the character of the landscape. How do we make a choice between different views and perceptions of nature and the way nature should be managed (see for instance Ruijgrok

et al 1999). This is a trade-off that cannot be based solely on scientific (ecological) knowledge. It concerns preferences of nature organisations, local people, visitors to the areas, and policy makers.

Limited understanding of wetland functioning in relation to flood management

It is known that different functions can benefit from wetlands, and wetland managers have (from their own experience) a general idea of how to manage multiple use. However, the impacts of multiple use on the natural resources of wetlands are not well quantified. It is, for instance, unclear what the precise impacts are of temporary storage of surplus water in nature (wetland) areas. This is currently an important issue in the Netherlands. Temporary flooding of wetland areas with water from mainly surrounding agricultural land will increase the input of nutrients into the system. Also, flooding will have an impact on wildlife in the area. Surplus water could also be effectively stored on agricultural land. This will cause economic damage, but storage in wetland areas will cause ecological damage.

Stakeholder participation

In many of the cases studied, we found a number of constraints on the implementation processes of the projects, and there seems to be a general consensus on the need for an open process in which different stakeholders can participate and compensation schemes can be developed. Active participation of stakeholders in open plan processes may help to overcome or decrease the level of conflict (Grimble and Wellard 1997; O’Riordan and Ward 1997). Stakeholder participation is however not a guarantee of consensus. Conflicts may still lead to constraints in the planning process. However, communication and participation helps to build up trust relationships and the likelihood of cooperative actions. Wetlands can be regarded as multiple-use common-pool resources, where multiple actors use the common resources in different ways (Steins and Edwards 1999). Platforms for collaborative planning are a promising way to stimulate stakeholder participation in identifying management alternatives (Röling 1994; Goosen and Janssen 2002). Scientific tools, like mediation or negotiation support models (Cocks and Ive 1996), or integrated evaluation tools (Joerin and Musy 2000; Grabaum and Meyer 1998), can be used to facilitate the discussion among stakeholders in such platforms for collaborative planning. Mediation models serve as tools to provide stakeholders with insights into the consequences of their own preferences and those of others.

Summary

The results of the inventory are summarised in Table 1. Some projects, such as the Alkeet-en Foppenpolder, the de Wieden project, and the urban wetlands, have developed relatively smoothly. These projects are relatively small and had short term and concrete goals (recreational and nature development, urban water management). We found that the larger, integrated projects are faced with the constraints described above.

Table 1

Wetland projects and the main constraints that they faced (constraint +, major constraint ++)

Project	National goals – local constraints	Limited sense of urgency	Lack of institutional coordination	Unclear views over nature conservation	Limited understanding of wetland functioning
De Venen	++		+	++	+
De Vechtstreek	+		+	++	
De Wieden				+	
Blue Network		+	++		
Alkeet- en foppenpolder					
Wolfsbarge	+	+			+
Noord Holland	+	+	+		+
Urban wetlands					+
The Blue City	+	+		+	+

Lessons learned

There seems to be intellectual and political consensus at the national level with regard to the way in which water should be managed over the next century. However, implementation at local and regional level has proven difficult. From the analysis of some water management projects we demonstrate how projects initiated over the last decade encountered some major constraints. These can be grouped as 1) issues related to space (local versus regional/national interests); 2) issues related to time (short term action for problems occurring in the long term); 3) issues related to a lack of institutional coordination; 4) unclear views on nature conservation goals, and; 5) a limited understanding of the costs and benefits of different water management options. The issues in regard to the planning of wetlands are complex; not only because of many conflicting and often unclear interests of different stakeholders, but also due to differences between long term and short term perspectives and institutional complexity. Water management is no longer a single-use issue; it has become a multiple-use management problem.

To improve the planning process it is crucial to realise that these issues exist. There seems to be a consensus on the need to stimulate co-operation among policy makers, (local) stakeholders, and scientists from both natural and social sciences at the earliest stages of decision making. This is easier said than done. How do we organise such a process, who should participate, and what if stakeholders do not want to participate or if they try to block the process? Stakeholder participation and communication and co-operation between scientists and policy makers may help identify and possibly reduce the conflicts, but this will not solve all problems. In some cases financial compensation is the only solution. Platforms for collaborative planning could however improve the communication between stakeholders and stimulate early identification of possible conflicts and compromises. A promising research area is then how to facilitate this process of collaborative planning. Examples of the application of relatively simple and flexible tools for negotiation support and conflict mediation in Australia are promising (Cocks and Ive 1996; Abel et al 2002). Such a mediation support model is being developed with the “Wetlands in the Randstad” project. The goal of

the model is to explicitly show what the various goals of stakeholders are and to what extent these goals are in conflict or could be the basis for compromise.

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