

Integrated Water Resources Management in The Netherlands: How Concepts Function

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Since the early 1990s, the concept of Integrated Water Resources Management (IWRM) has been known throughout the world (Mitchell 1990, Dublin Statement 1992, Global Water Partnership 2000, 2005). IWRM calls for a holistic management of watersheds. It emphasizes the need to give full consideration to surface and ground water, to quantity and quality issues, to ecology, to the relation between land and water resources and to the different socio-economic functions of the watershed.

IWRM has received a lot of attention, but important questions still remain. For instance, what should be the objectives of IWRM? Should IWRM promote nature conservation, economic development, or the interests of the poor? And how should IWRM be implemented; through top-down comprehensive planning or bottom-up adaptive management (Mitchell 2005, Jeffrey and Gearey 2006)? Should all water-related competencies be integrated in one organization (Biswas 2004a, b), or is improved co-operation the key to IWRM (Mostert et al. in press)? And what about large dams, privatization, and water pricing?

This article aims to stimulate reflection on the IWRM concept using a country with a long IWRM history, The Netherlands, as an example. First, it introduces Dutch water management and then discusses the introduction of the IWRM concept in Dutch water management. Moreover, it discusses how IWRM was interpreted and the impact it has had on water management institutions, research and practice. In addition, the article concludes that IWRM is highly political. IWRM professionals have to decide whom and what they want to serve.

Dutch Water Management

The Netherlands is a small, densely populated country with an area of 37,400 sq km (including inland water) and a population of 16.3 million. The country lies in the delta of the three major North-West European rivers: the Rhine, the Meuse and the Scheldt. It is a very flat country. More than half of the country is prone to sea or river floods or to water logging (Huisman 2004). Average annual rainfall is about 800 mm, with a deficit in the summer months. Due to climate change, flooding and water scarcity problems may increase in the future (Können 2001).

Industrial and urban water pollution has been reduced drastically since 1970, but there is still a lot of historical pollution in the form of polluted sediments. Major problem substances nowadays are nitrate and phosphate from agriculture (Ministerie van Verkeer en Waterstaat 2005). Dutch agriculture is very intensive and uses about two-thirds of all the land.

Water management in The Netherlands is quite complex. Originally, water management was the responsibility of individual land owners and local communities. However, from around 800 CE onwards, many swamps were drained. This resulted in soil subsidence and necessitated supra-local flood protection and drainage works from around 1100 onwards. To supervise these works, regional waterboards were established. Moreover, from around 1400 onwards, small polder boards were established to drain small polders by means of wind mills (Ven 2004). Together with the regional water boards, they are the ancestors of the present

26 water boards responsible for management of most surface water and for sewage treatment. The sewers themselves are the responsibility of 458 municipalities.

At the regional level there are 12 provinces. They supervise the water boards and the municipalities; make water, environmental and land-use plans and regulate ground water withdrawals. In addition, they have an important role in nature protection.

At the national level, three ministries deal with water management. The Ministry of Transportation and Public Works coordinates the preparation of national water policy and national water legislation. Through Rijkswaterstaat (the State Water Management Agency) this ministry is responsible for the management of the major rivers and canals. The Ministry of Housing, Spatial Planning and the Environment is in charge of drinking water policy and legislation, environmental policy, and land-use policy. The Ministry of Agriculture, Nature and Food Security is, as the name suggests, responsible for national policy and legislation in the field of nature protection and agriculture.

Drinking water supply is the responsibility of 15 drinking water companies. Their legal status is that of private companies, but they are owned by municipalities and/or provinces.

The Netherlands is one of the founding members of the European Union (EU). The EU has a profound effect on water management, directly through its many water directives, which are binding for the EU Member States, and indirectly through its Common Agricultural Policy.

Systems Thinking

The term IWRM (“integraal waterbeheer”) was first used in Dutch water management in 1980 in the Province of Gelderland (Commissie Bestudering Waterhuishouding Gelderland 1980). The term became well known following the publication in 1985 of the report *Living with Water; Towards integral water policy*, and in 1989, IWRM became national policy (Ministerie van Verkeer en Waterstaat 1985, 1989).

IWRM in the first years can be summarized in two phrases: systems analysis and ecological approach. Systems analysis was first practiced in the Province of Gelderland. In 1970, the Provincial Government had set up a commission that was to

provide a scientific basis for an optimal management of surface and ground water quantity and quality (Commissie Bestudering Waterhuishouding Gelderland 1975, CHO TNO 1976).

At the same time, Rijkswaterstaat was struggling with the problem of balancing the different functions of the Dutch waters. Professor Toebees from Purdue University (Indiana, USA), on sabbatical in The Netherlands, suggested that “what you need is system analysis: it solves lots of problems in the States” (Blumenthal 1989, p. 18). Systems analysis was subsequently used in the preparation of the Second National Water Policy, published in 1985 (Rijkswaterstaat and Rand Corporation 1978, Wisserhof 1994).

In the same year, the report *Living with Water; Towards integral water policy* was also published. This report introduced the water system approach. It defined water systems as “the geographically demarcated, interrelated and functioning whole of surface waters, ground water, water beds, banks and technical infrastructure, including the existing ecosystem and all the accompanying physical, chemical and biological features and processes. The (boundaries) of a water system ... are determined in the first instance on the grounds of morphological, ecological and functional relationships” (Ministerie van Verkeer en Waterstaat 1985, p. 35). The water systems approach “gives priority to the water system The approach aims at optimal coordination of the wishes of society with regard to the functions and the functioning of the water systems ... by means of an integral consideration of (these wishes and) the potential of the systems ...” (Ministerie van Verkeer en Waterstaat 1985).

The water system approach thus involved the identification of water systems and the “balancing” (matching) of the social demands on and the potentials of these systems. Water systems were supposed to be physical entities with fixed boundaries. This approach did make sense for the large state-managed water bodies in the southwestern part of The Netherlands, where the approach was first developed (see the next section). It made less sense for the many small canals and ditches in the Dutch polders: half of The Netherlands would be a water system (Kuijpers and Glasbergen 1990). Therefore, an alternative approach developed, seeing water system

boundaries as flexible, depending on the functional relationships that are relevant in a specific case (e.g. the relevant systems are very different in the case of shipping, eutrophication or flooding). Currently, water (management) systems are defined briefly as “an interconnected whole of surface and ground waters” (art. 1 Water Management Act).

The Ecological Approach

Initially, IWRM had a strong ecological emphasis. The term was used in relation to issues such as eutrophication, polluted sediments, active ecological management and nature-friendly banks (Rijkswaterstaat 1987, Bijlsma 1988, Roijackers et al. 1992). This emphasis has its roots in the 1970s as well.

Around 1970, Rijkswaterstaat was planning the closure of the Eastern Scheldt as one of the last parts of the Delta Works, developed after the 1953 flood disaster to improve safety in the southwestern part of The Netherlands. A negative side-effect of these works was the loss of tidal area and of a profitable oyster culture. Previously, these side effects had not received priority. However, by 1970 environmental concern had grown considerably.

At first, Rijkswaterstaat did not respond to the new environmental concerns. This changed after the 1973 elections, which had brought a central-left government to power. Rijkswaterstaat was forced to re-evaluate its plans. In the end, it developed a very innovative but very expensive solution with minimal environmental impacts: the Eastern Scheldt storm surge barrier. In addition, Rijkswaterstaat attracted many biologists for its Delta Works department (Disco 2002, Brugge et al. 2005).

The ecological approach to IWRM was as much a political as a scientific approach (cf. Disco 2002). New issues came on the agenda and new solutions were proposed. The First National Water Policy of 1968 had focused exclusively on increasing water supply through large scale infrastructure. The Second National Water Policy of 1985 had introduced an economic approach to water supply and had touched upon the water quality issue. Only the Third National Water Policy of 1989 considered surface and ground water quantity and quality in an integrated fashion, but with a strong emphasis on nature protection (Table 1).

The ecological approach lasted approximately ten years. During the 1989 national elections, attention to environmental issues was at its peak (Nas et al. 1997). In the late 1990s, the deputy minister responsible for water management told her staff members not to pay much attention to ecological issues (personal communication). Partly as a result of (near) floods in 1993 and 1995 (Silva et al. 2004), flooding and water logging had received a much higher priority. The current Fourth National Water Policy from 1998 espouses IWRM as its basic philosophy, but gives IWRM a far less ecological interpretation and contains less ambitious goals (Ministerie van Verkeer en Waterstaat 1998).

Institutions

Already *Living with Water* from 1985 mentioned possible implications of IWRM for the Dutch water management institutions. IWRM requires close cooperation of all authorities with competency over or influence on the water system, well-developed legislation, and well-developed financing systems. In all respects there were problems. The number of authorities was large and their competencies were often overlapping. Water legislation had developed in a piecemeal and not very well coordinated fashion and there were still important gaps. Finally, the financing system was complex, with different taxes and charges and narrowly defined spending purposes.

Several institutional developments had already started before 1985. The number of water boards had decreased from 2500 in 1953 to 255 in 1985 and national water legislation was gradually being completed. In 1989, the Water Management Act was enacted, which introduced a planning system for surface and ground water quantity and quality. In theory, this planning system is coordinated with land use planning and environmental planning, but in practice it does not work well because of differences in planning frequencies, planning procedures and status of the plans (Kuijpers and Glasbergen 1990, Brussaard et al. 1995).

At the moment an integrated water act is being discussed in parliament (Heer et al. 2004). This act will replace the existing water acts and aims to improve coordination with land use planning, environmental management and nature conservation. It will not make Dutch water

Table 1. Third National Water Policy (Ministerie van Verkeer en Waterstaat 1989, 1990).

Main goal: “To have and maintain a safe and habitable country as the prior condition and to develop and maintain healthy water systems that guarantee sustainable use”

Subsidiary goal: Integrated water management based on the water system approach

“Target situations”

Ground water in the dunes and upper parts of the Netherlands:

- no desiccation
- no ground water pollution
- dunes as storage place for drinking water
- botanical quality of dune valleys unique in Western Europe

Springs, streams and meres:

- natural gradients, banks and drainage
- oligotrophic and isolated meres

Rivers:

- transport arteries
- salmon in the Rhine and Meuse in 2000
- green ribbons winding through the landscape

Ground water in the lower Netherlands:

- responsible management of ground water level
- sustained use of peaty soils

Lakes:

- “away with the green soup” (no eutrophication)
- sanctuary for fish, birds, otters and anglers

Dug waters (canals, ditches):

- not only for drainage, water supply and shipping, but also for migration of animals
- ditches as a richly spread table for stork and heron

Estuaries:

- ocean shipping without problems, creative use of spoil
- seal and porpoise return to deltaic area
- attractive for anglers, swimmers and surfers and for sailing

Seas:

- healthy fish and seals in a healthy sea
- North Sea source of raw materials and energy
- tourist attraction

Strategic goals to reach main goal (“tracks”)

- *Protection against pollution*, e.g. reduction of emissions between 50 and 90% and restoration of polluted water beds
- *Hydraulic design of rivers*, floodplains and banks, serving both human goals and ecology
- *“Guided use”*: no new water supply and drainage infrastructure, retention of rainfall, prioritization in times of shortage, sustainable groundwater use for economy, nature, forests and landscape
- *Organization and instrumentation*, regional waterboards based on hydraulic units, quantity and quality management under single control, policy instruments and financing system facilitate IWRM, transboundary issues

Interim goals for 1995 for each strategic goal (often more specific and far less ambitious)

Supportive policies to reach the (interim) goals

management simple. For example, for most areas there will still be three water policy plans, three or four water management plans, three land use plans, two or three environmental plans, and so on.

If institutional development were only a matter of expediency and efficiency, simpler and more transparent institutions would have been achieved a long time ago. As it is, institutional development affects many vested institutional interests and is highly political in nature (cf. Klijn and Koppenjan 2006). In this arena, IWRM has played an active, instrumental role.

As discussed, environmental management and water resources management in The Netherlands are institutionally separated, but in practice both policy fields overlap. This has resulted in competency struggles between the two ministries involved, especially concerning water quality management, ground water management and the issue of polluted water sediments. IWRM was developed at the water management ministry, but around the same time the environmental ministry developed its own integrated approach, called integrated environmental management. Analysis of the chronology of events suggests that the different approaches were developed, at least partly, in order to claim or defend authority over the overlap of their policy fields (Betlem 1998, p. 162). In a similar vein, the notion of IWRM has been used by the water boards to claim competencies and legitimate their existence as specialized water management bodies.

Academia

From the very beginning IWRM has had a noticeable impact on water management research and education. In 1986-1990, the University of Utrecht and the Delft University of Technology conducted contract research for the State Water Management Agency to support the preparations for the Third National Water Policy (Glasbergen et al. 1988, Kuijpers and Glasbergen 1990). Moreover, from 1993 onwards, part-time professors in IWRM, funded by Rijkswaterstaat were appointed at four Dutch Universities. Three professors came from Rijksinstituut voor Integraal Zoetwaterbeheer en Afvalwaterbehandeling (RIZA), the freshwater research institute of Rijkswaterstaat (including its director), and the fourth one was the director of a

regional branch of Rijkswaterstaat. In their courses, they presented the development and background of Dutch water management, with a strong emphasis on the Third National Water Policy. At the Delft University of Technology, much emphasis was put on the systems approach in water management. At this university a second part-time professor in IWRM was appointed, coming from the research institute WL | Delft Hydraulics.

Research for IWRM was typically interpreted as interdisciplinary research (Wisserhof 1994). Several interdisciplinary Ph.D. projects were set up, funded by Rijkswaterstaat, the Dutch Foundation for Fundamental Research and university funds, in which Ph.D. students from different disciplines co-operated on one water system, usually one of the major Dutch rivers. Several interesting Ph.D. theses came out of these projects (Nollkaemper 1993, Dieperink 1997, Verlaan 1998, Dieperink 1999, Lorenz 1999, Meijerink 1999, Veeren 2002, Timmermans 2004). The Ph.D. students co-operated a lot, but sooner or later their projects drifted apart. The IWRM concept could not sufficiently counter-balance the strong tendency in The Netherlands towards mono-disciplinary research. No interdisciplinary theoretical framework was used and the supervisors of the Ph.D. students had limited or no experience with interdisciplinary Ph.D. research. Frameworks that might have been helpful include “social learning” and “action research” (Ridder et al. 2005, Pahl-Wostl et al. in press.)

A number of Dutch researchers have critically reviewed the IWRM concept (Rooy and Jong 1995, Ast 1999, Slobbe 2002). Typically, they equated IWRM with the Third National Water Policy and its implementation. In their eyes, IWRM was eco-centric and technocratic, had a narrow water management focus and paid too little attention to the relation between land and water management, to public participation and to the societal and economic aspects of water management. Some of these researchers have declared the end of the IWRM phase in Dutch water management and the start of a new phase, called “total water management” (Rooy and Jong 1995) or “interactive water management” (Ast 1999). Others more modestly called for value-based discussion and action (Slobbe 2002).

Implementation

The ambitious goals of the Third National Water Policy have not been achieved completely, but significant progress has been made (Ministerie van Verkeer en Waterstaat 1996, 2005). To stimulate IWRM, several projects were initiated by Rijkswaterstaat in the 1980s and 1990s (Glasbergen 1992). Moreover, subsidies were given for IWRM pilots at the regional level. As discussed, these projects were generally ecologically oriented.

Several factors were identified constraining the implementation of IWRM (Kuijpers and Glasbergen 1990, Rooy 1995). They can be summarized under two headings: limited process management and contextual constraints.

Process management (or “network management”) refers to how co-operation and decision-making is organized. It refers to issues such as the type of project organization, facilitation of the process and in- and exclusion of stakeholders. Process management is often contrasted with hierarchical steering by one government body who sets directions and ensures implementation through legal and other means (Klijn and Koppenjan 2000, Bruijn et al. 2002). In IWRM there is usually no government body with sufficient resources to fulfill this role. Instead, direction setting and implementation has to be a joint activity involving a lot of cooperation

between all stakeholders. Several approaches and techniques exist to promote this (Gray 1989, Ridder et al. 2005, Pahl-Wostl et al. in press).

Several contextual factors complicate cooperation and decision-making. These include the formal institutional structure, discussed above, the political and scientific culture and environmental awareness. In Dutch politics, individual initiatives are often rewarded more than collaboration. There is still a lot of resistance against truly interactive approaches and sharing of responsibility. Government budgets are under pressure and increasingly legal accountability gets priority over efficacy and innovation. As a result, many individuals and organizations focus exclusively on their own tasks instead of taking a broad, integrated view. Many technical experts focus exclusively on their area of expertise and pay less attention to communication and co-operation with other disciplines, with water managers and with the other stakeholders. Finally, over the years water and environmental awareness have fluctuated. This has had repercussions for the social, political, and financial support for IWRM.

IWRM is still official government policy and the concept will be incorporated in the new integrated water act. However, the popularity of IWRM has decreased (see Figure 1). This can be partly attributed to the difficulties

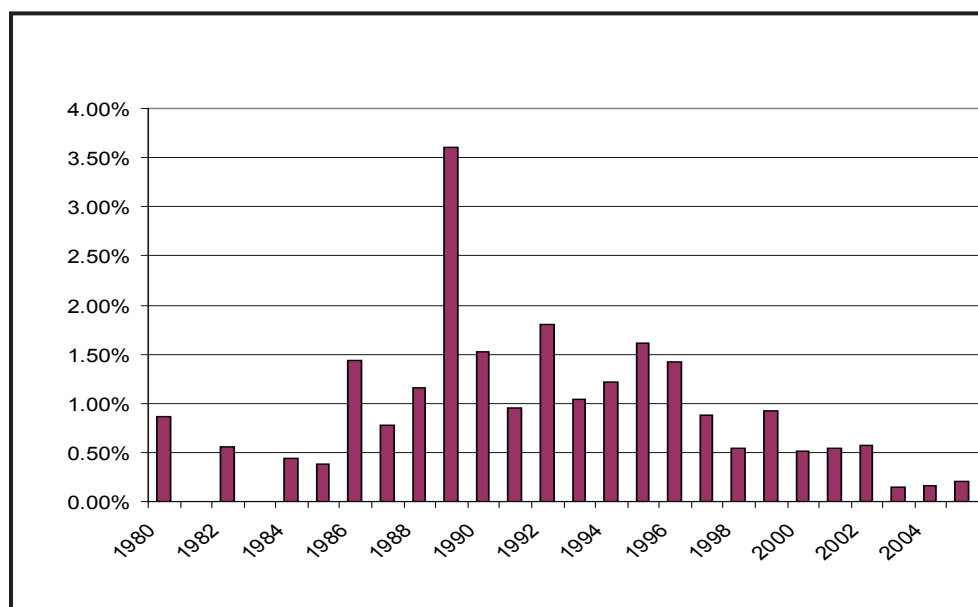


Figure 1. Percentage of Dutch water management reports, books and articles with “integrated water” in the title (based on the Hydrotheek database: <http://library.wur.nl/hydrotheek>).

of putting the Third National Water Policy into practice. As far as water quality and ecology are concerned, the importance of the Third and Fourth Water Policy has been eclipsed by the European Water Framework Directive (2000/60/EC) from 2000. This directive requires the EU Member States to prepare river basin management plans and reach a “good water status” of all its waters by 2015 (Kallis and Butler 2001, Kaika 2003, Kaika and Page 2003). In case of non-compliance they will eventually be fined by the European Court of Justice. A huge amount of attention in The Netherlands is now going to the implementation of the Water Framework Directive.

Discussion

What do the Dutch experiences tell us about IWRM? First of all, they tell us that IWRM is context specific. In The Netherlands, the IWRM concept emerged in a specific water management context, was interpreted and used in this context and in turn exerted some influence on this context. The same will be true in other countries. Consequently, IWRM cannot be evaluated independently from its context.

Secondly, the Dutch experiences show that IWRM functions ideologically. IWRM emphasizes the need to consider all aspects and all functions of water. At the same time, the concept hides the fact that in practice priorities are set and political choices are made. In The Netherlands, IWRM was defined in neutral terms (“system,” “co-ordination,” and so forth), but in practice it promoted, at least initially, ecology and nature protection and was used to defend the interests of the water sector.

The ideological functioning of IWRM is not primarily due to intentional, strategic behavior (although strategic behavior does occur). Rather, the case is that if IWRM is to function at all, it has to appeal to influential individuals and organizations. It has to fit in or link up with the world view and the values of individuals and organizations who can influence public opinion, research agendas, policy agendas and implementation. Thus, social and political relations influence whether and how the IWRM concept is used and how it is interpreted.

At this point it may be worthwhile to emphasize that this article has not analyzed IWRM as a specific type of water management. The problem with

this is that there is no agreement on what type of water management IWRM exactly is. Instead, this article has analyzed the functioning of the IWRM concept in a specific country. It has described how “IWRM” was introduced, used, interpreted and re-interpreted in The Netherlands. This has resulted in a richer picture of water management and the role that concepts, social relations, and power play in it (cf. the notion of symbolic power: Bourdieu 1991).

The current analysis is quite critical, but one can draw a positive lesson from it. If it is true that IWRM is inevitably ideological, the work of IWRM professionals cannot be neutral. They always serve someone or something. Their role is not limited to delivering technically and scientifically sound information. In addition, they have to listen and give a voice to all stakeholders, including the underprivileged. Or they can make another choice, but a choice has to be made.

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