

**For the future of Our Water:  
Historical Experiences with Organization and Functioning of Water Management**

Rationale for the new topic for 2002-2003

Tentative Guidelines for Authors

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# For the future of Our Water: Historical Experiences with Organization and Functioning of Water Management

## 1. Rationale for this Working Group's Comparative Study of Water Management

Water is perhaps the most vital of all natural resources for the sustenance of life on earth. As a *natural resource* we take it for granted since it is available in abundance for 71% of the earth is covered by the sea. Interestingly, in the northern hemisphere 61% of the surface is water, while in the southern hemisphere this is 81%. Of all water on earth, 97.2% is ocean water, 2.15% is stored in glaciers and icecaps, and 0.65% is available in lakes, streams, subsurface water, and the atmosphere. Fresh water thus amounts to less than 3% of all water on earth. The sources of sweet water are detailed in the table below. When we exclude the ice sheets and glaciers, it becomes clear that 94% of our fresh water is groundwater (figures and table from: Tarbuck & Lutgens, 1991:76, 95, 296-297).

Table 1      *Sources of Fresh Water*

Ice sheets and glaciers	84.945%
Groundwater	14.158%
Lakes and reservoirs	0.549%
Soil moisture	0.254%
Water vapor in the atmosphere	0.049%
River water	0.004%

This fresh water is used extensively every day for a large variety of our “needs”. The human dependency upon fresh water turns this natural resource into a *commodity* with a price. Introductory economics teaches us that commodification and scarcity are linked, although we cannot be really sure which comes first. It is in that situation that public authorities assume responsibility for the *access, distribution, and containment of water*. From very early on in history governments regulated water, and the degree to which varies with physical-geographical circumstances (e.g., aridness, delta, seasonal flooding, precipitation) and with population size and ~ density. Government-controlled water management emerges in more or less sedentary societies with urban centers.

With the exponential population growth since the 1850s, the pressure upon and thus struggle for drinkable water has intensified. Good water has by now become a very scarce product indeed, even though our senses register abundance.

For millennia people and their governments were mainly concerned with challenges of distribution of the available water quantity and with the containment of water. Concern for water quality, also a distributional challenge, is of much more recent origin, for it was not until the middle of the 19<sup>th</sup> century that health care professionals hypothesized a relation between water

quality and the frequent outbreak of epidemics in urban areas. Since then, governmental control over water has increased as a function of, i.a., population size and concentration. The pressure for good water is especially felt in the down-stream areas that are densely populated (such as, for instance, the western part of the Netherlands). More generally, the availability of good water is also a global concern given growing world population size. Where initially water management was a concern for local government, it became from the early modern age on also one for national government. Since the Second World War it has assumed international and supranational importance. Characteristic for contemporary water management from local up to inter- or supranational levels is a strive for *integral water management* which is a concept that refers to efforts at linking the various different water management functions with each other (e.g. quantity, quality, dyking) and with relevant other policy areas.

Ever since the Club of Rome's report in 1972 there have been calls for cross-boundary cooperation between governments with respect to water management. Good intentions, though, do not necessarily turn into decisions and implemented policies. While within the context of a sovereignty a more or less coherent and consistent water policy can be possible, success or failure of inter- and supranational efforts depend upon the willingness of the participating sovereignties to consider a common good larger than the interest of their own jurisdiction. This is why water is not simply a natural resource but also a commodity subject to pricing, distribution, and restraint (e.g., pollution). It is also why policy and decision makers must not only regard water management policy and its organization as a mere technical matter, but also - and preferably first - as a matter of institutional capability. Whatever is brought to the floor of inter- and supranational attention, is advanced by political and administrative representatives who take, and how could they otherwise, their own national experiences as point of departure. Surely this has something to do with familiarity and cultural wiring. There is, however, also a strategic dimension known as the *first mover advantage* (Knill, 2001:165), which is when one country takes the lead in a particular supranational policy and manages to convince others of the merits of their (national) approach. Within the European Union it is well-known that national leadership in advancing supranational solutions to policy problems is characterized by first mover advantage.

That being so, there is every reason to consider current institutional arrangements of national water management systems as a reflection of past national and subnational experiences. In the pressure for quick, ready-made, and - above all - guaranteed solutions, the (pen)ultimate decision makers may not always or not often have an eye for the path-dependent quality of their reasoning and proposals. A more explicit acknowledgment and assessment of the national heritage may very well serve satisfying results. A historical, i.e. developmental, perspective on the strengths and weaknesses of the structure and functioning of existing water management arrangements provides protection against blind and/or naive policy. In a short-term perspective history may appear efficient, which means that we respond to current environmental circumstances without regard for past experience. In the long(er) term perspective, however, such blindness for the heritage of institutional arrangements can jeopardize policy success.

Recognizing that water is becoming or has become the commodity most contested nationally and internationally led this working group to select the following research objective: *To explore the available institutional arrangements for access, distribution and containment of water within sovereignties* with an eye on the meaning of these and on lessons for inter and supra-

national cooperation. The central question is: *How have the structure and functioning of water-management systems within national political-administrative systems developed from the early 19<sup>th</sup> century up to the present?* This question in itself can fill a volume for each country. This working group advocates that historical knowledge is not only important in itself, but has meaning in the understanding of the present and thus has meaning in the shaping of the future. Hence, a second question is worthy of consideration: *To what extent do these national experiences influence policy and decision makers when engaging in inter- or supranational policy making?* Obviously as a working group that grounds its existence in the past we do not presume to predict let alone forecast the future. We do, however, presume that knowledge of the past is usable, not in a 'quick-ready-made-guaranteed' sense, but in an appreciation of experience that is - in the end - the first and last resort for guidance. Whether conscious of this or not, policy- and decision makers use their nationally defined collective and organizational memory when engaged in efforts to shape the future. The composition of this working group, while focused on history, is *multi-disciplinary*, and it is therefore an appropriate forum to address *the nature and scope to which contemporary and future challenges with the institutional arrangements for access, distribution and containment of water are determined by past experiences regarding the structure and functioning of national water management policies and systems.*

The institutional arrangement determines the degree to which water policy has been and is coordinated in relation to other 'concerns' and/or policies in the public and private sectors. This focuses the attention on issues of planning and coordination of water management policies. Having thus 'mapped' the national experiences with the structure and functioning of water management, we should be able to identify the strengths and weaknesses of it. A really good analysis of strengths and weaknesses of the current situation with an eye on the future can only start with a developmental perspective on water management since the early 19<sup>th</sup> century. Finally, an appreciation for the impact of the past has no disciplinary boundaries and so it is with gauging the future. Showing that history is not so much efficient but matters, requires the collaboration of an open-minded, multidisciplinary effort. Hence it is that this international working group aims at utilizing national historical experience for assessing inter- and supranational challenges to the structure and functioning of water management systems.

The past can be a wonderful means of satisfying the curiosity so inherent to human beings as much as it has been a source of revenge. Knowledge of the past, however, has been and can be used as an experience for present and future. As valuable as a *l'art pour l'art* approach is to civilization, it does not beat the interest in and importance of a historical perspective for the sustenance of that civilization. The national country studies in this effort will predominantly focus on development of water management since the early 19<sup>th</sup> century. It aims at identifying trends and patterns in water management that may very well determine how policy and decision makers now conceptualize and deal with water management challenges. History for its own sake is a fine scholarly pursuit, but it is also a scholar's charge to inform policy and decision makers of the degree to which the past determines present and future. By virtue of their academic environment, scholars can study the constraints of time and context better than those working in the political-administrative summit who often must take a short(er)-term perspective.

Assuming that at some point the structure and functioning of inter- and supranational water management systems is nationally determined we must establish a common framework of

communication. In the second section of this preliminary paper, therefore, some definitions of various aspects of water management will be proposed. In the third section I will outline major physical-geographical features relevant to water management. In the fourth section the important elements of organizational structures of water management will be discussed. These structures are nothing but reflections of what a people as a whole regarded as valuable. The question then rises to what degree institutional arrangements for water management were and are autonomous or semi-autonomous from or integrated within the national and sub-national governmental jurisdictions. The structural bedding provides the arena or boundaries within which policies are made (section five). In section six I will briefly explore some issues and challenges in inter- and supranational cooperation. Finally, section seven, will provide a tentative outline of sections to be written by the authors and some guidelines for resources.

## *2. Definitions regarding Water Management*

Most countries will have some kind of water management system. Studying these in a comparative framework requires agreement about certain concepts to guarantee a focus on the same issues.

First, we need to define the concept of *water management*. Unto the late 18<sup>th</sup>, early 19<sup>th</sup> century this concept only referred to the physical activities involved in access to, distribution of, and containment of water. It referred to ‘the state of water management’, i.e. the size of the flood plains, the strength of dikes, the capacity of windmills, and the duty of citizens to help in overseeing proper water management. Since some 200 years, the concept of water management has come to include the notion of government care for public health and safety. One of the unintended results of this is a slow but inexorable intertwining of general purpose governments (e.g., municipalities) and specific purpose governments (e.g., waterboards). Hence in our day an age water management refers to the technical capacity and the institutional arrangements that are needed to meet the political goal of providing safety from and usage of water in the widest possible sense.

This definition of modern water management implicitly assumes a description of traditional and more modern water management functions. Hence, second, we need to define which functions traditional water management serves. For the purposes of this paper, I will distinguish between four:

1. *Water quantity management*: access to and distribution of water through regulation and control of inflow and outflow of *surface water* and of the storage of *groundwater* in the aquifers some meters below the ground level. This is the major function of water management from the Middle Ages on.
2. *Water quality management*: access to and distribution of fresh water through regulation and control for consumption. This is a function of water management that emerged from the 1850s on at local level and became a national government concern from the 1960s/70s on.
3. *Dike management*: containment of water through the protection, regulation and supervision of natural structures (e.g., dunes) and physical structures designed to constrain excess water in rivers (from rainfall or meltwater) and to protect coastal areas from storm surges. This is also among the oldest functions of water management.

4. *Transport management*: access to water through the regulation and control of transport functions.

Third, the expansion of water management functions and the increased call for cooperation and coordination with other policy areas has in recent decades been expressed in the concept of *integral water management*. For proper understanding of this concept, a distinction needs to be made between the *internal functions* and the *external functions of water management*. The internal functions of water management have been described above (see a. to d. The external functions of water management concern a consideration of the degree to which policies regarding the internal functions influence policies in areas such as, for instance, physical planning and zoning, nature and environmental policy, sewage management, rural planning, and housing. Integral water management is a concept developed in the study of public administration which refers to a policy based on linking the internal functions to each other as well as to the external functions. Increasingly, planning and implementation of water management policies requires cooperation between and coordination of different public sector organizations.

### 3. *Physical-Geographical Characteristics relevant to Water Management*

The nature of water management is determined by the *objective* for it on the one hand and by the *physical-geographical characteristics* of the environment on the other. In Antiquity water was important for agriculture (e.g., ancient Egypt) and provisions of drinkable water for the population (e.g., Roman aqueducts). From the Middle Ages on it was also a means to generate energy (e.g., Dutch windmills) for the processing of agricultural products (e.g., grinding grain, mustard seeds, oil seeds).

The physical-geographic characteristics determine the nature of collective water management arrangements. We could think here of the availability of *surface and ground water* (in, e.g., arid and 'wet' regions), the presence of *high and low grounds* (e.g., areas below and above sea level), the *seasonal variation* in precipitation and meltwater flows in rivers, lakes, and tidal flows (for sea-bordering countries), the *river basins* (i.e., the drainage area of a river, relevant to occurrence of floods), the *flood plains* (i.e., the area which is designated to be flooded in case of excess water; also known as *spillways*).

### 4. *Structural Characteristics of Water Management Systems in (country X)*

The development of water management depends upon population size and density, available technology (e.g., physical structures such as dikes and canals; wind, steam, electricity), and social factors (such as, e.g., increased attention for water quality as a necessary condition for better health care). This is not an exhaustive list of variables, but at least each of these contribute to the scope and nature of the historical and existing institutional arrangements. Water management can be exercised on the basis of purely private, purely public, or mixed arrangements. Thus a distinction is useful between:

1. No institutional arrangements
2. Institutional arrangements on a self-governing basis (e.g., E. Ostrom, 1990),
3. Semi-autonomous institutional arrangements, and

4. Institutional arrangements through the public sector only. Within this category we ought to distinguish between

- a) water management organized within general purpose government, and
- b) water management organized as specific purpose government.

It is expected that no country represented in this working group is without institutional arrangements for water management. The second scenario is particularly interesting because historically water management arrangements developed bottom-up and upon the initiative of immediately interested parties. In her continuing research of *common pool resource management systems* (CPR's) E. Ostrom pointed out that some of these water management systems originated as collective action between private individuals. Examples she analyzes are the huerta irrigation systems in Spain since 1435, the irrigation communities in the Philippines since 1630 and she mentions also the Dutch waterboards existing since the 10<sup>th</sup>/11<sup>th</sup> centuries (E. Ostrom, 1990).

As time went by these self-governing or autonomous arrangements became linked to the system of general purpose governments (e.g., municipalities, provinces and regions, and, finally, national governments). Thus, water management systems became semi-autonomous. In the course of the 20<sup>th</sup> century, most water management systems have been embedded in the national political-administrative system at large. The degree of interdependence varies with production (who actually manages water), provision (supply of water), and governance (who regulates):

1. Water management as entirely a public sector activity: production, provision and governance in one hand;
2. Water management as a joint public-“private” enterprise: contracting-out or outsourcing of the management of water (as is the case in parts of the U.S.A.) while the governance (i.e., regulation and oversight) rests with public authorities;
3. Complete privatization of water management.

The central issue is here the scope and nature of government intervention and action *vis-à-vis* private ownership. The *descriptive issue* for our working group concerns the emergence and development of institutional arrangements (ranging from autonomy to embedded in government) as characterized by the degree to which a division of labor exists between public and private actors (i.e., in terms of production, provision, and governance). The *normative issue* that this working group could consider is the degree to which government should entirely control water management, exercise oversight only, or privatize it. The normative challenge is especially relevant in the context of increasing cross-border cooperation and coordination of water management policies.

With respect to the structural organization of water management systems attention should be paid to the coordination between technical and administrative units. Technical units within a water management organization are generally focused on the engineering, purification, and so forth, aspects of the job. Administrative units, on the other hand, are much more focused on general challenges of internal management (e.g., personnel, finance, public relations) and of external management (cooperation with and coordination between organizations whose tasks/functions have bearing upon water management). Technical units have always been important, while administrative units have gained in importance relative to the degree to which water management became embedded in public sector arrangements.

By way of illustrating how institutional arrangements can vary from country to country I

will briefly mention some of these in Belgium, England & Wales, France, Germany, Northern Ireland, Scotland and Spain (based on information provided by Van Malenstein, 1993; and Van de Ven, 1993).

*Belgium:* has small waterboards for quantity management; water quality (purification) in Flanders is organized as a special purpose unit while in Wallonia it is part of the municipal task.

*England & Wales:* Between 1974-1989 a system of integral water management existed organized through ten Water Authorities. Since then drinking water, sewage and waste water management have been privatized. The rest of water management tasks rests with National River Authorities.

*France:* has a central ministry for coordination and planning of water management policy. Each of the large river basins have waterboards. As in the Netherlands, complex institutional arrangements are in place for the enclosure of tidal embayments and reclamation of land in tidal areas and estuaries.

*Germany:* the legal framework is defined as federal level; the *Bezirksregierung* and the *Kreis* execute policy. The *Wasser und- Bodenverbände* (for instance, a *Deichacht*, *Sielacht*, and *Entwässerungsverband*) are embedded (i.e., *inliggend*) in the *Kreise*.

*The Netherlands:* the legal framework for water management is defined at national level, which is characterized by a integral water management approach. Waterboards as specific purpose government are completely embedded in the national political-administrative system.

*Northern Ireland:* water management as responsibility of the Ministry of Environmental Management.

*Scotland:* passive quality management through River Purification Boards that supervise the active quality task exercised by Regional Councils.

*Spain:* a system of integral water management for each river basin through independent regulatory bodies (in Dutch: *onafhankelijke bestuursorganen*).

## 5. Planning and Coordination of Water Management Policies

Obviously, most countries will have had centuries of experience with water management. It is not, however, until the late 18<sup>th</sup> century that water management becomes an object of conscious planning and policy making. Following some brief remarks on the major policy areas of water management, we should focus on the development between the traditional tasks (water quantity, dike management, and transport management) and the more contemporary task (water quality). With respect to the latter attention can be given to causes of pollution of surface and ground waters such as industrial and agricultural waste and sewage. Pollution has become increasingly pressing as a function of population size and density.

Identifying the policies and rules that govern them a distinction can be made between the day-to-day or operational tasks and rules, the collective tasks and rules that determine who does what, when, and how, and the constitutional rules that legitimize a particular institutional arrangement of water management (the distinction based on Kiser & Ostrom, 1982). First, we need to identify for which policies the water management unit (within general or specific purpose government) is directly responsible for (i.e. executes) and which policies are under the jurisdiction of other public sector units. The actual water management tasks concern the

*operational level of water management*. Second, we need to identify the degree to which it is required that water management policy is coordinated with other policy areas (such as, e.g, zoning of industrial, agricultural, and residential areas, environmental policy). This aspect is especially concerned with the *collective level of water management*. Finally, the sources of primary and secondary legislation (e.g., water quality acts since the 1960s/70s) need to be identified that together formulate the objectives of water management and legitimize it. This regards the *constitutional level of water management*.

## 6. *International, Supra-National, and Inter-National Challenges of Water Management*

A distinction can be made between international or global, supra-national and inter-national cooperation and coordination of water management policies.

In terms of *international cooperation and coordination*, the United Nations has called attention to water as public property and to the need for improved control over this most vital resource. We could briefly consider the degree to which national governments are involved with developing an international water management policy. At the *supra-national level*, within the European Union a variety of directives have been issued that directly (e.g., the Drinking Water Directive) or indirectly (e.g., the Environmental Impact Assessment, Community Eco-Management) influence water management. We could also consider the impact these had on redirecting national water management policies (as in, e.g., Knill, 2001). Finally, there is the *inter-national level*, which regards the cooperation and coordination of water management policies between individual and neighboring countries. Two excellent examples of this are:

1. The Rhine Water Treaty of 1963. Given the industrial pollution by, especially, chemical industries in the Rhine river basin an international Rhine committee was formed in 1950. The 1963 Bern Treaty formalized this effort. It was signed by France, Germany, Luxembourg, the Netherlands and Switzerland. The EU entered the treaty in 1976 (also the year of the Rhine Chemical Directive, 76/464).
2. Efforts to reduce pollution of the North Sea through cooperation between Belgium, Denmark, France, Great Britain and the Netherlands.

Cross-border cooperation is also manifest in *cross-border or inter-national organizational arrangements*, such as those that exist between Germany and the Netherlands and between Belgium and the Netherlands.

Inter-national cooperation and coordination regards both *direct pollution* by identifiable sources (e.g., pipes through which industrial waste is directly dumped in surface water, also dumping of sewage into surface water of rivers and sea) as well as by *indirect pollution* (also known as diffuse pollution, from agriculture and from the air, such as through industrial and car traffic exhaust).

## 7. *Example Outline of National Country Studies and Some Guidance concerning Resources*

The authors of the national country studies could provide information about the issues discussed above and organized according to the following sections:

1. Introductory remarks on current challenges of water management (1 page)

2. Brief overview of origin and development of water management (1-2 pages)
3. Development of Organizational Structure of Water Management since the early 19<sup>th</sup> Century (i.e., the internal organizational structure of the water management unit) (3-4 pages) (see for possible aspects to be addressed, section three above)
4. Development of Water Management Policy since the early 19<sup>th</sup> Century (i.e., the internal policy and decision making processes) (3-4 pages) (see for possible aspects to be addressed, section four above)
5. Interlocking of Water Management Policy with other Policies (i.e., the link between internal and external functions/policies) (3-4 pages) (see for possible aspects to be addressed, section five above)
6. Inter- and Supranational Challenges (in terms of international, inter-national, and supranational arrangements) (3-4 pages) (see for possible aspects to be addressed, section six above)
7. Concluding Section on Meaning of Historical Perspective for Contemporary Policy- and Decision Making (1-2 pages).

Information on the history and development of water management in a large variety of countries can be found in the national country studies written under the auspices of the International Commission on Irrigation and Drainage (ICID; created 24 June 1950, headquarters in New Delhi) which is a non-governmental organization. In 1977 the ICID encouraged its national committees to conduct a study on irrigation and water management. These studies are specifically focused on the institutional arrangements for water quantity management (e.g., for the Netherlands: Van de Ven, 1993). Clearly this IIAS working group casts a much wider net, yet must restrict itself to fewer pages. Nevertheless it is worthwhile to explore the information available through the ICID and in the appendix you will find a list of addresses of national committees.

Other sources of information on development of water management policies since the early 19<sup>th</sup> century can be found in:

- a) *juridical literature*: (e.g., water management law is among the oldest bodies of law in the Netherlands);
- b) *historical literature*: (e.g., on development of local government functions)
- c) *legal-historical literature*: (e.g., within the literature on the history of state and administrative law),
- d) *historical-geographical literature*: (e.g., on development of interrelation between land and water), and
- e) *engineering literature*: (e.g., concerning technological design and capacity).

As far as I can tell, the attention in the study of public administration for water management in general, and certainly for the development of the institutional arrangements of water management systems is marginal if not non-existent. The strength of this working group's study will not be in the detail of specific aspects of water management, but in the sweeping overview of the most important existing institutional arrangements and the international, supra-national, and inter-national challenges that lie ahead.

#### *Suggestions for Size and Format*

The average paper size should be between 15-25 pages (line spacing 1.25). In the printed format

as produced by ets. Bruylant each chapter ranges between 18-22 pages (including summaries in French or English). The total volume should limit to approximately 300 pages in print. The two working languages for this working group are English and French.

*Final Remarks in View of the Agenda for 20 April 2002*

This content of this paper is tentative and serves only as preparation for discussion during the working group's meeting at Royal Holloway College on 20 April 2002. As is clear from these pages water management is quite a complex field of research and our discussion should clarify which aspects we wish to and can deal with as country *rapporteurs*. You will have noticed that this paper primarily describes potential subjects of our attention, yet does not explicitly outline a theoretical framework in order to secure a solid comparative study. Elements of such a theoretical framework are provided in the text through categorizing functions of water management (quantity, quality, dikes, transport), defining potential institutional arrangements (autonomous to embedded), and distinguishing between levels of rules (operational to constitutional). We should therefore also consider these and other theoretical frameworks. Suggestions for strengthening and finalizing the tentative framework presented here are welcome.

*Tentative Time Table*

1. Revised author's guidelines by general *rapporteur*: June 2002;
2. Brief draft of country study: December 2002 (table of contents, some general remarks per section, to be send to *rapporteur*);
3. Complete draft of country study: April 2003, annual meeting working group;
4. Revised draft of country study: June 2003.
5. Production of volume: to be determined by IIAS office in Brussels.

## Brief List of References

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- Van Malenstein, A.G. (1993). Waterschap in international perspectief (i.e., Waterboard in international perspective). In J.C.N. Raadschelders & Th.A.J. Toonen (eds.), *Waterschappen in Nederland. Een Bestuurskundige Verkenning van de Institutionele Ontwikkeling* (i.e., Waterboards in the Netherlands. An Administrative Science Exploration of the Institutional Development). Hilversum: Verloren, 171-178.
- Van de Ven, G.P. (1993). *Man-Made Lowlands. History of Water Management and Land Reclamation in the Netherlands*. Utrecht: Matrijs (ICID national study).

## **Appendix**

**National Committees of the International Commission on Irrigation and Drainage** (only those countries are included who are or have been represented in this working group).

The website address for the ICID: [www.icid.org/nc1](http://www.icid.org/nc1)

- Australia:

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Website: <http://www.cancid.org>

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- Great Britain:

Mr. Christopher Kiely  
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