Drainage Institutions in Western Europe:

England, the Netherlands, France and Germany

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Preface

This paper is one of a series of products created under a collaborative work program between the Rural Development Department of the World Bank, Washington D.C., and the Irrigation and Water Engineering Group at Wageningen University, the Netherlands. The program ran from 1999 to 2002 and was headed by Dr. Geert Diemer (World Bank) and Dr Peter P. Mollinga (Wageningen University). Dr. Mollinga served as primary editor for the series of products coming from this program.

The activities in this program focused on participatory irrigation management. Through this cooperative program, Wageningen University staff participated in the Training of Trainers programs organized by International Network on Participatory Irrigation Management (INPIM) in Bari, Italy.

The views expressed in the research papers are those of the authors, and do not necessarily reflect the views of the program coordinators; Wageningen University; or the World Bank or its Board of Executive Directors.

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Abbreviations

ADA	Association of Drainage Authorities
DDA	*Directions départementales de l'agriculture*
DE	Department of Environment
DWI	Drinking Water Inspectorate
EA	Environmental Agency
EC	European Commission / European Council
ECJ	European Court of Justice
EEC	European Economic Community
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EQS	Environmental Quality Standard
EVE	*Entwasserungsverband Emden* (*German:* water association, Emden)
FDR	Federal Republic of Germany
FNDAE	(*French*) National Fund for Water Development in Rural Areas
HMIP	Her Majesty's Inspectorate of Pollution
IA	Irrigated Area
IPC	Integrated Pollution Control
IDB	Internal Drainage Board
IDD	Internal Drainage District
LKV	*Landschafts- und Kulturbauverband Aurich* (*German:* water and soil association)
MAFF	Ministry of Agriculture, Fisheries
NRA	National River Authority
OFWAT	Office of Water Services
PA	Performance Assessment
PLI	Public Local Inquiry
SAGE	(*French*) local water resources development plan
SDAGE	(*French*) catchment / basin water resources plan
UES	Uniform Emission Standard
VAT	Value Added Tax
VNF	(*French*) public organisation managing navigable public ways
RWS	Regional Water Authority
WLA	Water and land Associations
WM	Water Management
WO	Welsh Office
WUA	Water User Associations

Preface

The present draft report is one of the outcomes of the author's stay in WAU as a visiting fellow in The Irrigation & Water Engineering Group (May 11 – August 7, 2000). Since the draft report could not be completed in Wageningen, about three weeks time in September, 2000 was spent at Lucknow to complete the draft report.

The draft report consists of a review of drainage institutions in England, The Netherlands, France and Germany. The major portion of the report was a desk study at Wageningen and at Lucknow. However, short visits were carried out in the four countries studied. In The Netherlands, two field trips were carried out. The first was a visit to Delfland Water Board organised by Ms. Tinke Vanderploeg who, apart from being an academic staff in a technical institute, is the elected member of the Delfland Water Board. Another visit was carried out to the water board of Alblasserwaard.

In conducting the study, I received help from a number of institutions and individuals. It may not be possible to mention all of them. However, I would like to mention the contribution of the following institutions and individuals. First and foremost, I would like to express my gratitude to the IWE Group, WAU and the World Bank which provided for my stay in Wageningen and visits to other places.

At WAU, Dr. Peter Mollinga helped me on innumerable occasions in innumerable ways, including going through the draft twice. Ms. Annemiek Verhallen and Mr. Bert de Jager introduced me to the Dutch water boards. Prof. Linden Vincent arranged my meetings in England and Mr. Gerrit Van Vuren helped in arranging the visit to Germany. Mr. Flip Wester drove me to France and translated the discussions and Jan-Willem Knegt gave useful comments on my draft on England and Germany and drove me to Ost Friesland in Germany and Alblasserwaard in the Netherlands and made notes based on visit to Ost Friesland in Germany. Lastly, I would like to acknowledge the necessary secretarial assistance provided by the Irrigation & Water Engineering Group secretaries, Ms. Trudy Freriks and Ms. Gerda de Fauw during my stay in Wageningen. The major portion of the report was typed by Ms. Trudy Freriks who came to complete the draft report on a Saturday.

Executive Summary

Drainage areas in all the four countries of Western Europe studied – England, The Netherlands, France and Germany – comprise of low-lying areas, which at one time consisted of vast stretches of marshes, fens, peat and washes. In some cases, they also include those areas which were often inundated by floods. All these lands were and still continue to be agriculturally highly productive after the drainage work was executed.

The origin of drainage institutions in all four countries can be traced back to the middle ages. The organisational forms were initiated in the eleventh or twelfth centuries by farmers, monks and local communities. The technical designs and organisational structures of such institutions were perfected as polder boards in reclaimed lakes in The Netherlands, drainage boards in England, *Wateringues* in France and dyke / drainage boards in Germany.

A common feature of these local bodies was that they were initiated out of the collective need of the people. These institutions were financially and democratically autonomous and remained so until the 1950s. The floods of 1953 changed the forms and content of these local drainage institutions.

A lot of changes have occurred since the 1980s mainly on account of increasing environmental concern, economic development and greater pressure on land. Now, higher government has assumed greater responsibility safeguarding the public interest leading to enactment of new laws in all the four countries. The impact of these developments has been minor, for instance, in England and major in The Netherlands. In the latter, water boards have assumed multipurpose functions, often leading to merger into the larger water boards, e.g., Delfland Water Board.

Modern legislation concerning drainage institutions has taken place in the twentieth century in all the four countries. In England, the legislation concerning IDBs was enacted in 1930 and amended in 1976. In case of The Netherlands, such a law was passed in 1992. In France, the most recent law passed in 1992 leaves the ownership rights untouched, but limits their significance, since it unifies all categories of water under the nation's common heritage – a concept close to the notion of public trust. In Germany, the new law concerning WLAs was enacted in 1991 which replaced the regulation of 1937.

Drainage laws in all the four countries are based on the following *three principles*:

- The responsibility for land drainage rests first and foremost with individual farmers.
- Land drainage is predominantly a local problem and the decisions regarding it should be taken locally.
- Those who benefit from land drainage or create a need for it should pay accordingly.

The institutional framework in all four countries consists of a three-tier organisational structure (National, Provincial / Regional and Local) with well-defined responsibilities at each level. But, there are differences too. While in England, France and Germany, one or two ministries have primary responsibility for water management, in the Netherlands, a number of ministries are involved at the national level. The other major difference is that while in the Netherlands, recent changes in water management have been effected as a consequence of a number of Acts passed at the national level, in the other three countries the same has been effected by means of a very few Acts.

In three out of four countries, funding for drainage is based on the principle that the beneficiaries or affected persons pay for it. Land drainage in England is financed by ratepayers and farmers with aid and grants from The Ministry of Agriculture, Food and Fisheries and some contributions from The European

Community. Drainage in The Netherlands is financed by three main sources: Central government's budget, levy-system of Pollution of Surface Waters Act and, water board taxation. In France, there is a substantial amount of public funding both for field and arterial drainage. The finances are derived from several different levels of administration. In Germany, expenditure involving the installation and maintenance of drainage networks within the command area of Water and Land Associations by the membership fee, which has to be paid as public charges.

There is an extreme paucity of data concerning the impact of drainage on productivity. A general feature noticeable in all the four countries is the tremendous increase in agricultural production and its productivity after the Second World War. However, it would be difficult to isolate drainage as the sole cause of this increase. Only in the case of France, drainage performance assessment (PA) was carried out by farmer boards or farmer associations. The PA programme was launched in the late 1970s in the French *department* of *Eure et Loir* located 100 kms. to the west of Paris. Yield values were monitored in several sub-surface drained fields and the results showed that drainage had positively contributed to agricultural yield.

In all the four countries, integrated water management (WM) has been effected. In England, the results of the various changes introduced by various Acts was, on one hand, to concentrate regulatory and management functions into hands of fewer and fewer individuals and, on the other hand, to highlight the importance of large river basins rather than individual sections of rivers as the basic unit of WM. As in England, in The Netherlands too, integrated WM is a task for public authorities and not for private bodies. In France, similar to what happened in England, initial moves towards a more holistic and sustainable water policy took the form of regionalisation leading to creation of a new and supplementary regional tier in the form of six basin level agencies. In Germany, integrated WM refers to an integration of water protection requirements into other policy areas. This also means that protection of natural environment and ground water reserves.

The principle of subsidiarity is observed in all the four countries, albeit in different forms and to different degrees. England, which does not possess any written constitution, presents particular challenges to the application of the subsidiarity principle. On the one hand, power is highly centralised in The Crown and its representative, The Parliament, and on the other, there is a tradition of local authority involvement in many policy areas including environmental policy. In The Netherlands, subsidiarity needs to be understood not as a constitutional principle for the division of competence but as a principle guiding the consensus-building process. In France, centralism of policy-making is combined with extreme decentralisation of decision-making in the communes. The structure of the state government in Germany has been shaped by the subsidiarity principle. The federal constitution recognises the pre-eminent role of the *Länder* and guarantees their statehood and autonomy. This constitutional guarantee is absolute in the sense that this basic feature of the constitution cannot be altered in any way.

Introduction

This study enquires into institutional arrangements associated with drainage development in four countries of Western Europe, viz., England, The Netherlands, France and Germany. The objective is to produce an overview of the range of options developed in various countries

The research methodology used in the report consisted of a desk study and field visits to the countries studied. Accordingly, about a week was spent in England in connection with the study. The duration of visit to the other countries was two days in France, five days in Germany and visits to the water boards of Delfland in the north and Alblasserward in the south in the Netherlands. During the visits, apart from collecting published material / data, personal interviews were carried out in all the four countries with the competent authorities and knowledgeable farmers. Field visits were carried out in England and Germany and in France, we passed through the agricultural areas of *Wateringues*.

As regards the organisation of the report, it consists of five chapters in addition to the introduction in the beginning. The introduction provides a brief background of the study and the background data (in the annexure) in respect of four countries forming part of the study. Chapters 2 – 5 provide an institutional review of the four countries. The review has been done under nine common headings. Chapter 6 provides a summing up of the study. It consists of a summary of the main features of drainage institutions in the four countries, the major institutional strengths of each of the four countries and the key trends.

The background information concerning the four countries has been provided through appendices 1 – 9 which are appended at the end of the report. These deal with a variety of parameters from geographical and hydrological characteristics to various indicators of water management including some of its institutional components.

Drainage has played a historic role in the evolution and development of irrigated agriculture in the West European countries - The Netherlands, England, France and Germany. Although it is mentioned that about 30% - 40% cultivated area in developed countries is having drainage facilities, this does not apply evenly in all the areas. Drainage is necessary mainly in low-lying, one-time marshy or peat areas or low-lying coastal areas threatened by flooding. Agricultural-field drainage is much less important in other areas. For instance, a region like North Rhine – Westphalia (site of the author's first field visit to Germany), which is agriculturally quite important, does not need any significant drainage.

In the Netherlands, drainage is historically associated with marshy, thickly wooded delta formed by the rivers Rhine, Meuse, Ems and Scheldt. The lowest-lying land stretches along the western side of the country, from Zeeland in the south up to Groningen in the north, and includes substantial areas of polder. These are mainly reclaimed areas in which the water level is substantially lower. In England, such areas from part of the east coast consisting of the Fens, the Wash, the marshes of East Anglia and the lower reaches of Thames. In addition, Romney Marsh and other salt marshes of the south coast of England also constitute such areas. In France, it consists of Bas-Champs of Picardy and Veys of Normandy, the marsh of Dol and the foreshores of Mon-St-Michel, the Vendée and Saintonge marshes. In Germany, the soggy areas in the north – the valley of the Weser and large areas along the river Elbe constitute such terrain which requires drainage.

Keeping in mind that this study is woven around drainage, it would be necessary to explain what drainage means. In hydrological terms 'drainage' includes the land phase of the water cycle from the moment precipitation reaches the earth's surface to its return to the atmosphere through evaporation, evapo-transpiration, or its disposal as surplus water to the sea (Penning – Rowsell, *et al* 1986). The term 'land drainage' thus includes full spectrum of physically interdependent drainage problems from agricultural soil drainage improvement to urban flood alleviation. Nevertheless the term is traditionally most closely associated with the drainage of agricultural land as is reflected in official statements, about the prime objective of drainage such as Water Space Amenity Commission (Penning - Rowsell, *et al*: 26) "*Controlling and maintaining the water table in agricultural land to enable its maximum use for food production, and the disposal of surface water runoff and effluents without the creation of water flooding problems in agricultural land and urban areas*".

Other official objectives of drainage are stated as defence against seawater and arrangements for flood forecasting, warning and emergency action.

Drainage Institutions in England

Introduction

The history of land drainage in England goes back at least as far as Roman times when pioneering attempts were made to reclaim areas of fen and marsh for agricultural purposes. The dawn of the modern era can be placed somewhere in the seventeenth century when the first experiments in sub-surface drainage took place. This was at the height of the "enclosures", the movement whereby the majority of peasants were displaced from the land and the commons and large medieval open fields were divided gradually into private farms and estates. This new pattern of privately – owned fields often reflected drainage conditions and ditches were dug along boundaries. At about the same time, the Dutch engineer Cornelius Vermuyden was constructing one of the first big arterial drainage systems in the East Anglian fens (Baldock 1984:120).

In England, urban flood alleviation and agricultural land drainage are inseparable. In many parts of the country, agricultural activity is inhibited by the soil – water regime. Therefore, increasing agricultural production here depends upon the provision of adequate field drainage. This, in turn, depends on having adequate discharge capacity in the network of interconnecting drainage channels and downstream rivers. These rivers and channels often pass through urban areas and can cause flooding. Towns and cities, on their part, may discharge their rapid storm runoff to downstream agricultural areas, again causing possibly flooding or preventing field drainage. (Penning-Rowsell, *et al* 1986: 1)

Legal Basis

In England and Wales the Land Drainage Act 1976 is the principal statute in the realm of flood alleviation and land drainage. Under Section 116 of the Act 'drainage' includes: defence against water (including seawater), irrigation other than spray irrigation and warping. Warping is the process of flooding low-lying land so that alluvium is deposited thereby adding to the land's fertility. Also: 'land drainage means the drainage of land and provision of flood warning systems'. Section 17 of the Act expands the definition by stating that drainage works include the improvement and maintenance of existing watercourses and the construction of new ones. Section 81 of the Land Drainage Act 1930 excluded the distinction between irrigation and spray irrigation and made no mention of flood warning systems. But, both spray irrigation and flood warnings have become more important since 1930 and they are included within Section 38 of the Water Act 1973. This example shows how the legal definition of land drainage has evolved in relation to needs over time (Penning – Rowsell *et al* 1986: 27). British land drainage law is based upon four principles which have been enumerated below. These fundamentally affect the influence, decisions and behaviour of both individuals and organisations and underlie the organisational structure for flood alleviation and land drainage. In particular they define the powers of the agencies concerned and the nature of financial arrangements.

The principles mentioned above are:

1. The responsibility for land drainage rests first and foremost with the individual riparian owner.

2. Land drainage powers should be permissive rather than mandatory: their use is optional rather than obligatory.

3. Land drainage is predominantly a local problem and decisions about it should be taken locally. Consequently, land drainage decision-making is locally based, within catchment areas, for the routine urban flooding and agricultural drainage.

4. Those who benefit from land drainage or create a need for it should pay accordingly. This principle is embodied in Section 30 of the Water Act 1973 and in other principal legislations on land drainage (Penning – Rowsell *et al* 1986: 27 – 29).

In modern times the issue of enhancement of food production through reclamation of land by means of drainage was initiated by the appointment of a Royal Commission in 1928 and this culminated in the passage of the land drainage Act in 1930. This led to the setting up of public authorities in the form of Internal Drainage Boards (IDBs). The Royal Commission had concluded that in order to provide sufficient food for the growing population those areas of potentially good land, but which suffered from flooding and bad drainage, must be brought into production.

The criterion for deciding the boundaries of IDBs was decided by the 'MEDWAY' letter of Ministry of Agriculture and Fisheries dated 28th June 1933 according to which, "the area which may be brought within the limits of drainage districts are those which will derive benefits or avoid danger as the result or drainage operations" (Wisdom 1966: 297-301). IDBs which have the power to raise income are based on three principles: (I) everybody benefits (II) everybody pays, and (III) everybody has a say.

Institutional Framework

The MAFF and the Welsh office in Wales (WO) are responsible for flood protection and land drainage. In England and Wales a two – tier system is in place. The Environmental Agency (EA) provides the blanket cover while the IDBs and some local authorities concentrate on more localised areas that demand attention. These operating authorities liase closely to avoid duplication.

The basic principles on which drainage institutions work in England and Wales are (Correia *et al* Vol. I 1991: 541)

- A strong central framework;
- Integrated management of drainage by a national authority (EA) with catchment based regions
- National regulation by agencies, subordinate to the responsible Ministry which act as quasi-independent agencies and whose members are not elected but appointed by the government;
- Very limited power or responsibility for local authorities generally (but significant roles in some areas)
- Statutory public consultation in many decision making processes;
- Statutory requirements to provide registers for public information.

A summary of institutional relationships for water management in England and Wales is shown in *Figure 2.1*.

The National River Authority (NRA) was created in 1989 for better regulation of water and greater enforcement of regulation policies, more particularly those dealing with the quality of water. Formation of NRA as a single body covering the whole of England and Wales meant policy legislation and regulation

has been developed and co-ordinated at the national level. Although the NRA was not an elected body, its appointed Board members represent a wide range of interests. Public involvement was ensured through a consultation process including the preparation of charging schemes, strategies, catchment management plans and quality objective. The creation of the EA has further strengthened the integrated approach to river basin management and specific duties associated with sustainable development and the need to take costs and benefits into account in exercising its functions (Sheriff 1996: 69).

The EA is responsible for the maintenance of a decent environment in England and Wales and is one of the most powerful environmental regulators in Western Europe. Operational since April 1996, EA was formed from National River Authority (NRA), Inspectorate of Pollution, Waste Regulation Authorities and Units from the Department of the Environment (DE). It is a non-departmental public body sponsored by the DE, MAFF and WO. The management structure of EA at national level and in the Anglian region is depicted in *Figure 2.2*.

A 15-member board governs the EA wherein 12 members are appointed by the Department of Environment, 2 by the MAFF and 1 by the Welsh Office. At the regional level there are regional advisory panels subsuming regional committees consisting of Regional Flood Defence Committee, Regional Environment Protection Advisory Committee, Regional Fisheries Advisory Committee. At each level, area environment groups find representation in committees to enable an effective consultation process.

The main functions of EA are: (I) pollution prevention and control, (II) waste minimisation, (III) management of water resources, (IV) flood defence, (V) improvement of salmon and fresh water fisheries, (VI) conservation; (VII) navigation and (VIII) use of inland and coastal waters for recreation.

The EA has following eight offices, Anglian, NorthEast, NorthWest, Midlands, Welsh, South West, Thames, Southern and SouthWest. It has powers under Water Resources Act 1991, Land Drainage Act 1991 and Environmental Act 1995 which provide for: (I) general supervision over all aspects of flood defence, (II) installation and operation of flood warning systems; constructing and maintaining sea tidal and fluvial defences, improving and maintaining those water ways, which are a part of the designated main river system. This system includes the major rivers in the country, the designation of which is confirmed by MAFF/WO, and it is only upon such river lengths that EA is able to undertake 'operational' activities.

The Anglian Region which is one of the eight regions in which whole of England is divided for the purposes of administration of environmental regulations, is the driest and lowest lying in Britain. It contains some of the oldest drainage institutions in whole of Western Europe such as areas now covered by Middle Level Commissioners[1], Kings Lynn Consortium[2] and modern agricultural farms of Cambridgeshire. In some of these areas the evolution of drainage institutions can be traced to pre - Roman times.

The role of the regional manager Water Resources is to monitor river flows, ground water levels, rainfall and climate, and he issues abstraction licenses in order to balance the need of abstractors, and those of the environment.

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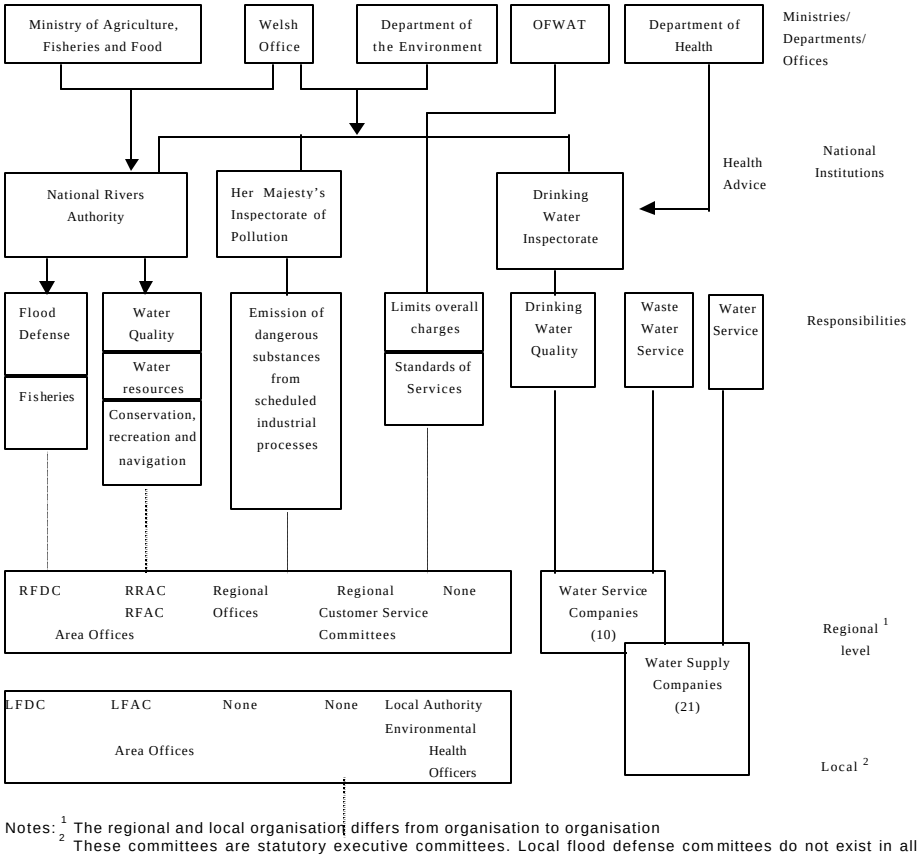
[1] The term 'Middle level Commissioners' refer to a drainage jurisdiction with a total catchment area of 70, 000 ha. The catchment area refers to the fens reclaimed during the 17th century which lies between the river Nene to the northwest and Great Ouse (old Bedford river) to the east.

[2] Kings Lynn Consortium was formed in 1967 by 6 IDBs. Today it is a consortium of 16 IDBs covering an area of about 100, 000 ha with 3500 kms of water courses. The area lies in the north-east of the area of middle level commissioners.

Figure 2.1 Summary of the principle institutional relationships for water management in England and Wales



Notes: [1] The regional and local organisation differs from organisation to organisation
[2] These committees are statutory executive committees. Local flood defense committees do not exist in all NRA regions.

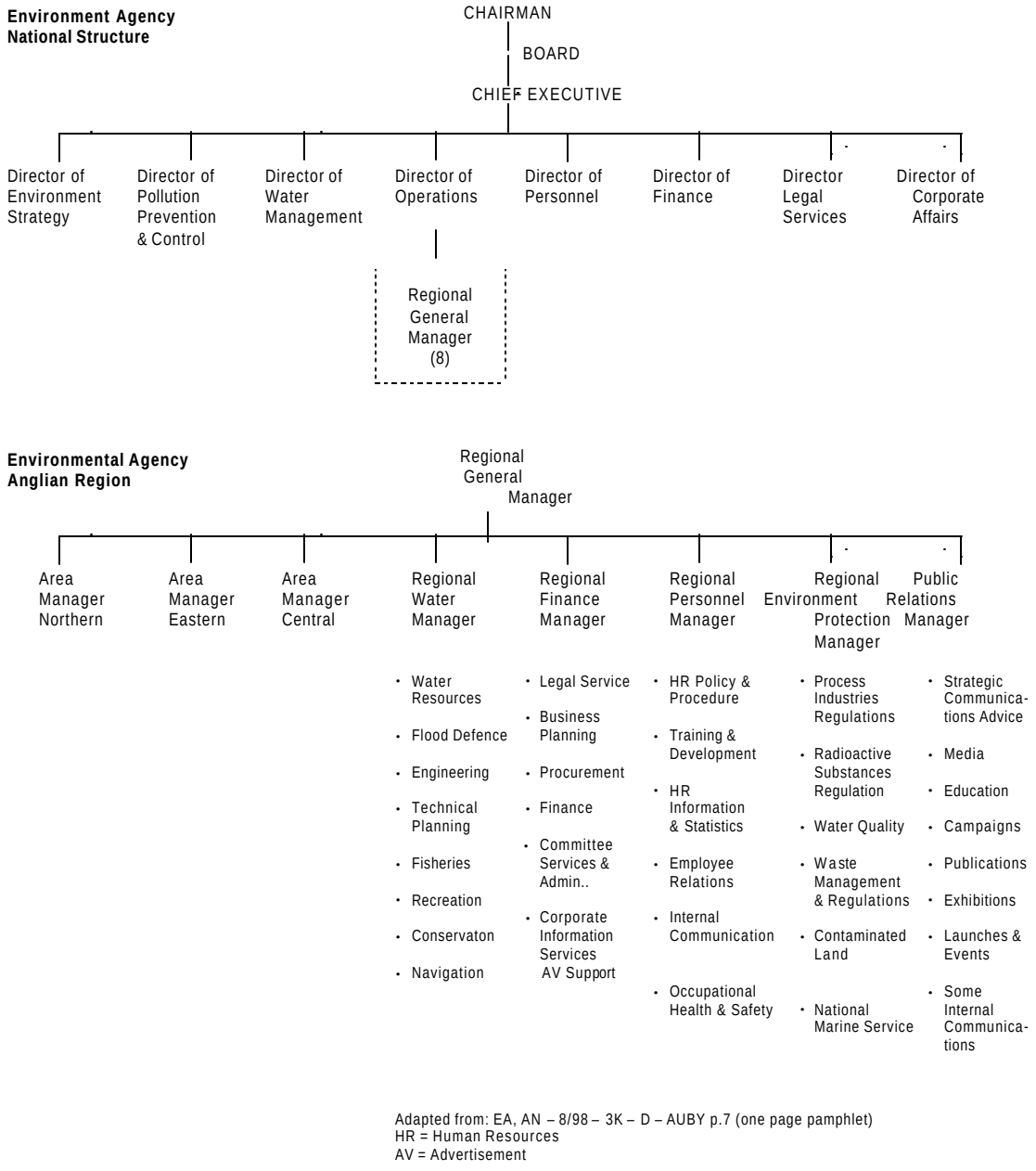
RFDC	Regional flood defense committees.
LFDC	Local flood defense committees.
RRAC	Regional rivers advisory committees
LFAC	Local fisheries advisory committee.
OFWAT	Office of Water Services

Reproduced from: **Correia *et al* , 1998 Vol.I: 542**

Drainage at Local Level

The Internal Drainage Board is a statutory public body with clearly defined tasks of flood defence (within the framework of Environmental Agency and District Council), surface water level management and O&M of local systems, not only for agriculture but for other rural functions as well. The Board consists of both elected (farmers) and nominated (levy-paying councils) members (from 7 to 40), who are appointed for three years. The board is a fully executive, operating within the financial and other regulations applicable to all public bodies within England and Wales. The fixed number of elected members is chosen from the farmers/-land holders within the area, based on a plural and proportional (land) voting system. The levy paying councils nominate up to a maximum of 50% + 1 of the members (even if the council is contributing over 90% of the revenue of the board). These members often are civil servants.

Figure 2.2 Management Structure of Environment Agency



Adapted from: EA, AN – 8/98 – 3K – D – AUBY p.7 (one page pamphlet)
HR = Human Resources
AV = Advertisement

Presently, there are 235 IDBs covering 1.21 million ha of land of which 810 thousand ha are dependent on drainage by pumping out of excess water. As mentioned in the preceding section, in England, IDBs are catchment-based organisations unlike, for example, in Denmark, where drainage organisations at the local level are administrative units. At times an IDB in England spreads over two or even three district areas.

In England, the size of IDBs varies between a few hundred ha to about 40000 ha, the average being 5261 ha. In terms of their management, IDBs can be grouped in three categories consisting of a total of 65 management units. First, there are about 8 to 10 small IDBs each of which is managed by a part-time staff (clerk), who maintains their accounts, records and does other necessary things which are necessary for an IDB to perform under the England law. Second, there are 22 such IDBs who employ their own staff and have their own offices. Of these, six or seven are very big and some of these contain as much as 40000 ha of land under their management. The third group consists of thirty-three to thirty-five IDBs, where a single management looks after a group of IDBs. Among them some have formed a consortium of their own. The best known is Kings Lynn Consortium of IDBs, which was formed in 1967 by a group of 6 IDBs. The group 23 years later consists of 16 IDBs covering an area of 100,000 ha with 3500 km of water courses of varying sizes.

In the past, IDBs were working with mainly agricultural interests but in the present times they have other interests such as industries and colonisation and in fact some of the IDBs now have nuclear power stations. Again, in the past land drainage legislation was driven by agriculture and food production. Today, much of the work being carried out by drainage authorities is to protect urban areas that run risk from flooding, or to accommodate increased run-off from new housing and factories. Consequently IDBs now get more of their income from local councils than agriculture. In 1999, IDBs total income was £ 28 million – 61% of it was coming form the city councils and 39% from agriculture. Ten years earlier, in 1989, 53% of income was coming from agriculture and 47% from city councils[3] (Noble 2000).

Another change that has taken place is that, in 1989, drainage mainly focussed on getting rid of water but now the focus is on water management and drainage is defined as "managing water levels in the system". Consequently, enterprising farmers in Cambridge area are resorting to laser levelling of their agricultural fields the economics of which favours them on account of resulting yields. The last reclamation in England was done in 1974. After that neither any reclamation was done nor it was needed and there is no plan to reclaim land in the near future.

Funding for Drainage

Land drainage in England is financed by ratepayers and farmers with aid and grants from MAFF and some contributions from the European Community. In very broad terms the cost of new arterial drainage is divided fairly evenly between local authorities and MAFF. However farmers installing field drainage can qualify for grants in the range of 30 – 70 percent. The largest spenders on arterial drainage are Water Authorities in England and Wales. The Authorities finance drainage work by raising a levy, known as "precept" on county councils in their area and obtain an average grant of about 55 per cent from MAFF for new projects. Although farmers benefit from this arterial drainage improvement, they escape any significant contribution to the cost, since agricultural land is exempt from county council rates. Furthermore, farmers can claim sizeable sums in compensation for any land they lose in the course of river widening projects which may be designed to increase the profitability of their own farms (Baldock 1984: 140 – 141).

In case of the Environmental Agency, the legislation enables the agency to require payment from local Authorities which at present include County Councils, Metropolitan and Unitary Authorities and IDBs. These arrangements provide the main source of its income. Other sources of income include capital grants from MAFF or Welsh office. An additional grant premium is paid for tidal and sea defence projects. In

[3] Based on a personal interview with Mr. Noble, Secretary-General, ADA on June 26, 2000

addition, a general drainage charge can be levied on all agricultural land, other than that within internal drainage districts (IDDs)[4], but only the Anglian Region is utilising this provision. The Agency also receives contributions from developers of sites and infrastructure, including industrial, residential and highway developments, to fund works to flood defence and drainage system which are necessary as a result of the development taking place and to ensure they did not create or increase flood risks.

In case of drainage boards as mentioned in the preceding, the boards have two primary sources of income: (I) the direct rating of all agricultural land and buildings, (II) special levy payments received from local authorities, which reflect the extent of other property in the District (Brussel 1998: 73). In addition to this income, board can secure grants from MAFF/WO towards the cost of 'approved' capital works and seek contributions form developers where proposals, industrial development, highways, etc. necessitate either immediate or future improvements to the drainage system.

Other local authorities raise direct income through the council charges. They also receive from the Central government income set against the uniform business rate collected from the area. This income is then supplemented by the central government support towards local expenditure. The cost of work carried out to reduce the risk of flooding or on the maintenance of drainage systems will normally be provided from general income. If the development proposals mean that preventive work must be undertaken, the local authority will receive a contribution towards the costs.

Impact of Drainage on Agriculture

Much of the lowlands in Britain, where reclamation of land through drainage has been effected are densely populated. However, less than 30% of the workforce is employed in agriculture and most urban inhabitants have little or no contact with farming life (Baldock 1984: 119).

During World War II, drainage assumed significance as a part of an effort to increase food production. Drainage work was encouraged by introduction of 50% government grants and the Ministry built up a fleet of its own draglines and trenchers. A new system of support for farming was introduced with the 1947 Agriculture Act which established deficiency payments regime and gave farmers higher guarantee prices.

This ushered in an era of stability and rapid technical advance. Drainage and other forms of agricultural improvement were encouraged with capital grants, and farmers had a security which made an investment of this kind worthwhile.

The consequence of all these developments was that from a level of 10, 000 – 15, 000 ha a year in England and Wales in the 1940s, the land reclamation through drainage rose to 40, 000 ha by 1960 and then doubled during the next decade to settle at a level of 100, 000 ha a year during the early 1970s. The last reclamation was done in 1974.

The concerted effort of government policy gave a boost to agricultural production and on Britain's entry into the EEC in 1973, arable farmers in particular enjoyed a period of prosperity with prices of both

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[4] Drainage boards, when constituted within catchment areas, are called internal drainage districts. External drainage districts are constituted outside catchment areas. Both internal and external drainage districts are lowland areas which derive benefit or avoid danger as a result of drainage operations and they consist of drainage districts or areas established under the Land Drainage Act, 1861 (repealed) or subsequent legislation. (Wisdom 1986: 1)

cereals and agricultural land rising rapidly. In the years following, Britain became 75% self-sufficient in temperate food (Baldock 1984: 119-122).

General statements are made to show the impact of drainage on agriculture. For instance, the Ministry of Agriculture, Fisheries and Food (MAFF) spends £ 14 million per year on drainage but it yields £ 10 billion of food grain production[5] (Noble 2000).

Integrated Water Management

The initial moves towards a more holistic and sustainable water policy in England took the form of regionalisation. The result of the various changes introduced by the Land Drainage Act of 1930, the 1948 River Boards Act, the 1963 Water Resources Act and ultimately 1973 Water Act was, on the one hand, to concentrate regulatory and management functions into the hands of fewer and fewer, increasingly centralised bodies and, on the other hand, to highlight the importance of large river basins rather than individual sections of river as the basic units of water management.

This process of institutional concentration, linked to broad hydrographical management, was prompted by a series of concerns that included the need for effective flood control, the growing demand for sufficient and rationally organised water supplies for industrial and urban growth, and an increasingly scientific approach to water resource management, presented as preferable alternative to local political control. The 10 British Regional Water Authorities (RWAS), created in 1973, fully embodied this approach. Spatially organised around 10 major river basins and associated families of smaller basins, previously under the control of the River Authorities and Water Boards, they represented a significant shift of management responsibilities away from local government and towards a technocratic and supply-fix management style (Buller 1996: 289-302).

The regional water authorities remained in existence for 15 years and, no doubt, significant achievements were realised in integrated management. However under Margaret Thatcher's privatisation programme in 1989, water sources were privatised and the service provision for sewerage, sewage disposal and for water supply passed into private ownership. The privatisation in 1989 created a clear separation between the regulated and regulators. At present the Office of Water Services (OFWAT) and EA regulate 10 privatised water service companies. To improve their efficiency many of private water companies have contracted out a number of their services to companies or non-regulated subsidiaries, which have to compete for the services (Rees and Zabel 1998). However, it should be understood clearly that even the great privatisation programme of Margaret Thatcher did not touch local drainage boards because she realised that IDBs were doing a good job and were making profits and were not a burden on the government[6] (Noble 2000).

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[5] Based on a personal interview with Mr. Noble, Secretary-General, ADA on June 26, 2000

[6] Based on a personal interview with Mr. Noble, Secretary-General, ADA on June 26, 2000

Public Participation and Conflict Resolution

Participation in Water Management in England and Wales occurs at three levels: formal consultation; public involvement; or actual direct participation by the public. Formal consultations often leave the public in the role of the "objector" and ignore the "silent majority" focussing more on the more vociferous minority of the population. Public involvement is less formal and can take a variety of farms. Although not allowing the public to be directly involved in the decision making, it provides the public with the opportunity to comment upon plans for river works or the redevelopment of a river location, or to indicate what they want from the rivers that flow through their own local area and which they use for recreation and amenity (House 1999: 125-130).

Local inquiries are used widely as a mechanism for resolving disputes over local policy questions and individual cases and for providing a mechanism for public participation. There are many examples of their use in water management. The procedure of a public local inquiry (PLI) is used in most cases where a formal instrument is being developed to provide for local policy (such as a statutory plan). PLIs or hearings (a hearing follows the same general approach as a PLI, but there is not the same right for persons other then the parties to the dispute to take part) are required in nearly all appeals to a Minister. The local inquiry system is thus an administrative tool widely used to strengthen the element of local democracy. Public Participation in England and Wales is obtained through a number of other instrumentalities such as consultation, public registers, custom service committees, regional and local advisory committees, consumer opinion polls, citizen and environment initiative and the citizen charter (Rees and Zabel 1998 Vol. I: 604 – 606).

Subsidiarity

The foundation of the subsidiarity principle, as it has now entered through the Maastricht Treaty on European Union into the constitutional order of the European Union, is seen in the social encyclical letter *Quadrogesimo anno* of Pope Pius XI in 1931:

"…. just as it is wrong to withdraw from the individual and commit to a group what private enterprise and industry can accomplish, so too it is an injustice, a grave evil and a disturbance of the right order, for a larger and a higher association to arrogate to itself functions which can be performed efficiently by smaller and lower societies. This is a fundamental principle of social philosophy, unshakeable and unchangeable. Of its very nature, the true aim of all social activity should be to help members of a social body, but never to destroy or absorb them." (Emiliou 1992: 384-385)

Due to the terms, 'private enterprise and industry', this English translation can be read in favour of privatisation in water management by invoking and narrowly interpreting the distinction between the state and the private sphere. A different interpretation comes through on the basis of the German translation. The terms *'eigene Initiative'* (own initiative) and *'eigene Kräfte'* (own powers) refer to the human individual. The instruction is now seen as neutral in relation to the legal status of the (potentially) arrogating institution.

Rather, the subsidiarity principle spelled out in *Quadrogesimo anno* is a pervasive socio-philosophical concept applicable to organisations of family, community, municipality, society and state.

The United Kingdom with no Written Constitution presents particular challenges to the application of the subsidiarity principle. On the one hand, power is highly centralised in the Crown and Parliament; on the other hand, there is a tradition of local authority involvement in many policy areas including environmental policy.

England and Wales, Scotland and Northern Ireland form three largely self-contained hydrological units (and can easily be subdivided further). In relation to water management, the role of local authorities (municipalities) has diminished since the early twentieth century and has practically come to an end with the privatisation of water supply and sewerage in England and Wales in 1989. Autonomous roles for municipalities which would correspond to the subsidiarity principle in its constitutional sense, are thus denied. Regionalisation of water management, corresponding to subsidiarity in the functional sense, has taken place only within the framework of a centralised institutional structure.

Drainage Institutions in the Netherlands

Introduction

"God created the earth but the Dutch made Holland". This saying indicates the extent to which the Dutch landscape has been formed by man (Perdok 1995). The adverse geographical position of The Netherlands has forced the Dutch people to set-up an intricate technical and administrative management of water over a period of more than one thousand years. The contrast is remarkable: out of infertile marshes they have created fertile polders (Wagret 1959: VI-VII).

The strength of human character is most apparent in the harshest situations when survival is threatened. In such situations, people may come together and work for a cause which safeguards everyone's survival. Here, we find an interesting similarity between the Dutch polders and the *ahar* and *pynes* of South Bihar which were historically the most important source of irrigation in South Bihar and provide unique examples of participatory irrigation management. On casual examination, the area in South Bihar would seem utterly unsuited for rice cultivation both from the nature of the surface and the comparative scantiness of the rainfall. But both difficulties have been overcome by the ingenuity and industry of its inhabitants, who have devised a system by which the natural drainage is blocked and the water impounded for use and have also brought rivers into their services by diverting the water they bring down. The indigenous system is, thus, the outcome of the natural conditions and physical configuration of the country and has been evolved to meet the obstacles, which they place on cultivation (O'Malley 1919). In fact the similarity does not end at harsh positions of two but goes beyond that and what the Dutch pioneer Vierlingh wrote in 'Hope of Poor Folk" at the end of his life in 1570 is true of South Bihar even today. He wrote about saving a polder when he was woken up in the middle of the night. He writes, *"I saw the danger. The breaches were wide because the dyke had subsided to a great extent. At dawn, with the beating of drums I summoned every one to work. Women brought clay in their aprons, others made up fascines, yet while others carried bags upon their shoulders. I had the combined help of a great number of people and we succeeded in filling the breaches"* (Wagret 1959: 82). To meet out the emergencies farmers in South Bihar come out in a body and this is called *goam.* The call for *goam* is made by beating of drums. The drumbeater goes from place to place announcing the nature and the location of the emergency (Pant 1998: 3136). In South Bihar, even today it is not uncommon to witness huge crowds, summoned by a call regarding the breach, coming from different villages with mattocks and shovels and collecting in one place to fill in and check breaches in *pynes*.

Water quantity management was already being carried out in the Middle Ages. The history of man made low lands in the Netherlands is the fascinating tale of man's fight against water, the loss of land and the reclamation of land from year 1000/1200 until around 1800. According to Wagret, from the thirteenth century until the beginning of the twentieth century, the area reclaimed from the sea and from inland lake was reckoned at 0.53 million ha but during the same period, the sea swallowed up 0.57 million ha (Wagret 1959: 16).

The period after 1800 is characterised by the invention of machinery, new sources of energy and considerable increase in scale. With the completion of IJsselmeerpolders and the Deltaplan, this last phase appears to have come to an end showing the way in which the Dutch have made and kept their lowlands habitable during the last one thousand years. In the present day integrated water management is being emphasised (Van de Ven 1993). This stage of water management is marked by a growing realisation that the increasing demand of water leading to a shortage of good quality of water as well as causing serious

damage to the environment. The response to these fundamental problems has been the concept of integrated water management. This means an inter-active framework with ecology, sociology and economy[7] (Van Rooy and De Jong 1995).

Another development in recent times is that greater attention is paid to the issues concerning the ecology of water. The national government is expected to evaluate the effectiveness of the legislation that is relevant for an integral policy and also to act in a more reserved and less sectoral manner in the implementation of national policy. National and provincial governments are required to give due attention to the creation of rules an regulations to provide the water authorities (water-boards) with opportunities to give form and content to the new concept of water management (Provoost 1991: 77-78). For water-boards, ecological water management is a next step in its historical evolution. This has consequences for the external and internal performance of its task. Together with others the water authority may, however, be expected to play an initiator's role, based on the responsibility for and involvement in all interests concerned with water. Therefore, the water authority can take the initiative and to ask, or even force others to think along and make a contribution (deWit 1991).

Legal Basis

The practical consequences of ownership of water in the Netherlands are limited. More important is the jurisdiction over water (e.g. water use regents and maintenance obligations, determined by public law). The following tables summarise the types of water legislation (*Table 3.1*), the water management tasks and the laws they are covered by (*Table 3.2*).

[7] This article is a part of the series "Towards Comprehensive WM in the Netherlands". Development in WM have been described in this article. The second article described the bottlenecks that are restricting the necessary progression in the way the Netherlands deals with water (Van Rooy 1995). The third article outlines inter-active planning as an accessible way forward for solving a part of these bottlenecks (Van Rooy 1996). The methodologies for exploiting the possibilities of interactive planning have been outlined in the fourth, fifth and sixth articles (Van Rooy *et al* 1997)

Table 3.1 Legislation concerning the responsibilities and tasks in water management

defining of responsibilities	organic law: Water Administration Act Water-boards Act	
defining of tasks	**classical water law:** Act on rules concerning State Water Works Rivers Act	modern management law: Pollution of Surface Water Act Groundwater Act Water Management Act Soil Protection Act Flood-control Bill

Table 3.2 Water Management tasks and legislation

Water Management Task	*Legislation*
surface water quality	PSWA
surface water quantity	WMA
groundwater quality	SPA
groundwater quantity	GWA
drinking water abstraction	GWA & WMA
drinking water supply	DWSA
sewerage	in prep.
flood-control	RA & FCA

Notes:

PSWA: Pollution of Surface Water Act, 1970
WMA: Water Management Act, 1989
SPA: Soil Protection Act, 1981
GWA: Groundwater Act, 1981
DWSA: Drinking Water Supply Act, 1958
RA: Rivers Act, 1908
FCA: Flood-control Bill (pending)

Sourrce: Reproduced from Perdok 1995: 11

Organic laws refer to the constitutional rules for organisations involved in Water Management (wm). in the Netherlands, four levels of governments are involved in WM. These are (I) Rijkswaterstaat (state), (II) the provinces, (III) the municipalities and (IV) the Water Boards.

Water Administration Act

The organisation tasks and competencies of Rijkswaterstaat are not specified in the constitution but in the Water Administration Act, 1900. This was specified in 1971 by an order in Council in 1971 and constitutes the following: Supervision of water management, protection against flooding, qualitative and quantitative water management, management of waterways and harbours, safe and prompt transport on waterways and, data collection (Perdok and Wessel 1998 Vol. I: 333).

Water Boards Act

The Water Boards Act of 1992 is similar in design and structure to the Province Act and the Municipality Act as all of these three acts create public authorities. But, while the first two acts create general democracies, the third act creates a "functional" public body. In addition, the Act contains additional provisions related to the Water boards' exclusive tasks in water management. In realistic terms, these are provisions concerning the compositions of the Water Boards Council, the competence to issue ordinance (*keuren*), financing and supervision (Perdok & Wessel 1998 Vol. I: 333)

Institutional Framework

In the Netherlands as in other democratic countries, administrative authority is based exclusively on enacted law and an independent judiciary ensures due process and compliance with the law. Although the Netherlands as a state emerged from a number of autonomous provinces, it can nowadays be seen as a decentralised unitary state with three hierarchical political democratic governmental levels: national, provincial (12) and municipal (+ 640). For water management, a special governance unit exists at local level: water boards, whose tasks are restricted to water management (Perdok 1995: 12).

water management at national level falls under the Ministry of Public Works, Telecommunications and Transport. The department takes care of the development Operation and maintenance of large infrastructural works. At national level inter-departmental committees decide on mid-term planning. The actual policymaking and control on regional and local water management lies with the Provinces (Brussel 1998: 77). In *Tables 3.2a and 3.2b* we present the various levels of government in the Netherlands, the water management tasks and most important actors.

Table 3.2a Four levels of government in the Netherlands

Type of Government	*Management by*	*Representative Bodies*
State	Council of Ministers	First and Second Chamber
Province	Governor & Executives	Provincial Council
Municipality	Mayor & Aldermen	Municipal Council
water-boards	Executive Board	Water-board Council

Table 3.2bWater management tasks and most important actors

Water Management Task	*Actors*
surface water quality	water-boards/State (2 provinces)
surface water quantity	water-boards

groundwater quality	Provinces
groundwater quantity	Provinces
drinking water abstraction	drinking water companies
drinking water supply	drinking water companies
sewerage	Municipalities

Source: Reproduced from Perdok 1995: 16.

Drainage at Local Level

The competencies over agricultural drainage in the Netherlands reflects its historical importance and at the local level is notably more democratic than many of the countries such as France, Ireland, England and Germany. The water boards known as '*waterschappen*' are perhaps the most individual of the bodies concerned with drainage. Their names and histories are varied and they are the oldest surviving form of governmental institution in the country. They first appeared as 'polder districts", local boards elected to manage individual polders. The need to maintain the dykes was a matter of survival for landowners and the tradition of a specialised democratic management body is a long established one (Hermans 1984: 97-98).

Until the 1950s the Netherlands had some 3000 water and polder boards, of greatly varying size, from less than 50 to several 100 ha. They consisted mainly of farmers/landholders with an elected council as chairman. Their tasks were confined to flood defence, drainage and water level management. Larger boards or joint polders of up to 10,000 ha or more acquired a tiered organisational system, with two layers of elected bodies and the chairman (dyke reeve) appointed by the Queen (government) (Brussel 1998: 77).

The law defines that the water boards are administered by the assembly (the general body), the executive board and the chairman. The assembly makes the important decisions on matters such as budget, taxation, orders and regulations. The executive board, composed of small number of members of those entitled to attend the assembly, is responsible for day-to-day administration and implements the decisions of the assembly. For the most part water-boards are self-financing, having power to levy local property taxes. They do receive grants from the central government towards the cost of major improvement works. Historically farmers were the most important group. However, growth of the population and urbanisation in the 20th century increased the number of interested participants. According to the interest-payment-participation norm, prevalent in the functioning of water boards in the Netherlands. House owners and residents are members of the water boards. Since 1970s water boards were made competencies dealing with water quality as well. Hence the 'polluters-pay' principle was applied (NHV, special 3, 1998: 37).

The number of water-boards has fallen drastically, particularly after the devastating floods of 1953. On January 1, 2000 their number stood at 57. It is expected that, by the year 2002 the Netherlands will have about 45 water-boards. However, despite the mergers, some of the water boards founded between 12th and 14th centuries still play an important role. The water board of Schieland (Rotterdam), for example, was established in the year 1273 and that of Delfland was established more than 700 years ago. As laid down in the constitution and Water Authorities Act, local and regional responsibility for water management rests with the water-boards. The provincial authorities are competent to set-up and abolish water boards, determine the water management tasks to be undertaken by the water board, the area in which they work, the composition of the governing and how its members will be chosen. The Province also supervises the work and the finance of the Water Boards (Unie van Waterschappen 1999: 4).

During the last decades, the water boards have been assigned additional tasks, such as water management for other than agricultural purposes and the task of surface water quality management (wastewater

treatment). As a result, many water boards have amalgamated into large bodies of 50,000 ha and larger (Brussel 1998: 77).

Agricultural areas, which were the main source of income of Water Boards traditionally, have witnessed a decline in providing income to the boards. For instance, in 1980, 53% of the total income of water boards was coming from "agriculture" areas and 47% from "built-up" areas. In 1991, a reversal of trend was witnessed. We find 45% of income coming from "agriculture" areas and 55% from "built-up" areas (Deurlo and Jurriëns 1993: 103)

Water boards have to perform three tasks. The first and the oldest is flood control, the second is water management, especially quantitative management. The third task is qualitative water management. One may find a close relationship in these tasks as can be seen in the following relationship – between flood control and river management, between river management and nature conservation, between ground water and surface water management, between dredging of canals and pollution control and, between drainage and water quality management. There are three ways of attaining integration among various tasks. The first by merging of single purpose water boards to multi-purpose water boards. The second is utilisation of the instrumentalities of planning at various levels. The third is execution of operational plans at the level of the water board (de Graaff 1997: 123-127). However, it should be clearly understood that not all the water boards are concerned with the task of qualitative management of water. Annexure 1 indicates the tasks of water management carried out by each water board in the Netherlands.

Historically water boards were farmer-organised and governed public bodies, with only farmers and land building owners as members. Presently all parties with an interest in WM are represented, and everyone has a say and pays a proportional fee. Even in a water board like Delfland which represented farmers' interest for a long time, farmer representation has come down to 5 members as against it there are 19 residents who get representation in a house of 42 members. In fact green house owners in water boards have acquired more importance in recent years.[8]

A typical water-board such as Delfland in the Netherlands is composed of a political chosen board and a professional staff and workers. The board is elected every four years out of those who are benefiting from the work of the water board. The general body (United Meeting) is the highest body. It meets four times a year. The executive board consists of 7 members (elected by the general board) and meets two times a month.

In contrast to Delfland water board, we have the water board of Alblasserwaard, which was established as far back as in 1277 and is still oriented towards agriculture and dairying and is dominated by farmers.[9]

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[8] The present position of interests and membership in respect of the Delfland water Board is as follows:

Sr. No.	Interests	Members	Basis of Charging
1	Farmers	5	safety + water level
2	Property Owners	9	- do –
3	Greenhouse Owners	4	safety / water level
4	Households	19	sewage / safety / water level
5	Industry	5	sewage treat

[9] The water board of Albwasserwaard was visited by the author with Mr. Jan-Willem Knegt on October 12, 2000.

This water board covering an area of 38260 ha most of which is pastureland comes under two provinces and deals with water quantity alone unlike the Delfland water board which is concerned with both water quantity and water quality. It has a general board of 30 members and an executive board of 6 members. The board has an annual budget of *f* 46 million. Farmers contribute 80% of its income, while others contribute 20%. Before 1990, all six members on the board used to be farmers. However, in 1990, regulation requiring representation for non-farmers came into force. All the same, voting rights are skewed in such a fashion that farmers can manoeuvre the election in their favour. The only election that has taken place after the 1990 regulation is that of 1998 in which too all six members elected were farmers.

Funding for Drainage

Drainage in the Netherlands is financed by three main sources – central government's budget, levy-system of Pollution of Surface Waters Act and, Water-board taxation. The main principle in financing a Water Management project is, that works (construction, operation and maintenance) of general public interest are paid for by the central government. This implies that the government finances major infrastructural works. The wastewater treatment task of water quality management bodies (provinces, water boards and Rijkswaterstaat) is generally financed by levies imposed upon all inhabitants and industrial activities. The basis for this charge is the pollution generated by the activity: "the polluter pays principle"

The Water Board Taxes

The Water Board Act (1992) determines that the costs of tasks exercised by the water-board are covered by themselves. They charge the owners of the real estate (amongst others that are less important) in their territory, in order to perform quantitative Water Management tasks. In case the water boards are responsible for very large works with benefits accruing to interests outside their territory (e.g. primary dikes), they receive a subsidy from the government. In addition, if they carry out works that imply a substantial improvement of the general water management situation, affecting areas beyond their jurisdiction then also they receive government subsidy (Perdok 1995: 24 – 25).

The surface Water Pollution Act enables authorities to charge for surface water quality management. This includes construction, maintenance and operation of sewage treatment plants and activities such as regulation, flushing, the clean up of polluted water bed and research. *Table 3.3* provides the details of charging.

Table 3.3 Charging on the basis of the Surface Water Pollution Act

Payee	***Receiving Water***	
	Regional water	***State water***
Companies discharging directly onto surface water	Charged by water- boards*	Charged by Rijkswaterstaat
Companies and house-holds discharging onto the sewerage system	Charged by water-boards*	Charged by water-boards Water-board* charged by Rijkswaterstaat for effluent of its stp, 50% deduction
Unconnected households	Charged by water-boards*, unless effective individual treatment system	Charged by Rijkswaterstaat, unless effective individual treatment system

Table 3.3 Charging on the basis of the Surface Water Pollution Act

Payee	*Receiving Water*	
	Regional water	*State water*

* Or the province Groningen and (in 1995) the province Utrecht and the municipality Amsterdam

Source: Mostert 1998: 11.

The revenue resulting from the pollution Act was ƒ 780 million in 1980, it was 1, 080 in 1985 went to 1340 in 1990 and rose to 1,940 million in 1996 (Mostert, 1998, p. 14). In 1995, the total revenue of water-board levy was ƒ 938 million. The revenue is used for "traditional" tasks of the water-boards: flood protection, drainage and (agricultural) water supply. The tariffs differ widely. For instance for the category "inhabitants", it can range between ƒ 16 and ƒ 92 per household depending on the local circumstances (Mostert 1998a: 15). In *Table 3.4*, the items of income and expenditure are indicated.

Table 3.4 Revenue of the Water Board Levy

Revenue	*in million guilders*	*Raised for tasks*	
Total revenue	938	Flood protection	180*
		Drainage & water supply	700#
		Others	57
Raised from			
· owners of unbuilt areas	315	Flood protection	13
		Drainage & water supply	296
		Others	6
· renters of unbuilt areas	18	Flood protection	2
		Drainage & water supply	15
		Others	1
· owners of buildings	361	Flood protection	96
		Drainage & water supply	230
		Others	35
· inhabitants	245	Flood protection	69
		Drainage & water supply	159
		Others	16

*Most of the water-boards' activities in flood protection are paid from subsidies

Covers all costs the water-boards make for this task

Source: Mostert 1998: 15.

The water-board levy is based on the full-cost recovery principal because costs are born by those in whose interest the costs are made. The general principle of water-board levy is "unity of interest, pay and say". The tax criteria for flood protection and quantitative water management are the surface for the un-built areas and economic value of houses and buildings. The pollution levy is applied to oxygen consuming substances and heavy metals. Considerations are under way to apply the levy to organic-chlorinated compounds that are harmful for aquatic organisms and the sediment.

The cost sharing also defines the representation of the categories in the general board and executive board of the water-board, e.g. the general board of the densely populated Principal Water Board of Delfland has 19 seats for the category of inhabitants, 5 seats for land owners, 13 seats for owners of houses and buildings and 5 seats for users of commercial and industrial facilities. The distribution of the seats in the executive board is 2,1, 2 and 1 respectively (Huisman 1997: 22). The financial position of Delfland

consists of costs for the task on the one hand and the tax revenue on the other hand. The balance between two forms the annual financial result. A multi-year budget is used to keep constant revenues in balance over a period of about 5 year (Spoek 1997: 27).

The evolution of water boards from flood defence and drainage oriented local authorities to agencies encompassing major aspects of integrated water management demonstrates the adaptability and sustainability of these water boards for over a thousand years. The floods of 1953 have been regarded as a watershed in the history of Dutch Water Boards because they made it apparent that traditional small-scale operations were insufficient to meet the modern standards of dike management. This led to a trial of strength that whether old traditions could survive and meet new challenges. Ultimately water boards emerged victorious and it led to the establishment of the first law on water boards ever in the Netherlands in 1992 (Dolfing 1999: 167).

Impact of Drainage on Agriculture

The production of Dutch agriculture has tripled since 1950. This was primarily achieved by mechanisation, drainage, new highly productive breeds and external means of production such as fertilisers, vet medicines, imported cheap fodder, fodder additives and pesticides. Agriculture in the Netherlands is well organised, highly efficient (both when measured per worker and per ha.), the most intensive in Europe and the source of huge export earnings. More than 70% of the land surface of the Netherlands is used for agriculture and in 1987 there were 132,000 farms and 258,000 people working on them. At an international level, Dutch agriculture has a leading position, not only in yield per ha, but also in the use of pesticides and fertilisers. Farming in the Netherlands has changed radically during the last 40 years, because of the following developments: increase in scale, specialisation, intensification, increasing mechanisation, decreasing field farming (intensive stock farming and substrate culture in green house sector) and, changes in the choice of crop. As a consequence of this, the input (water, pesticides, fertilisers, energy etc.) has increased spectacularly. This has caused a great deal of environmental pollution: fertilisers and pesticides have polluted soil, groundwater and surface water. Here it would not be out of context to mention that many changes in agriculture (i.e. pig- and cow-stables) have made itself less vulnerable for environmental deterioration it has caused (Perdok & Wessel 1998 Vol. I: 369 –370).

In the Netherlands agro-hydrological management, in interaction with use of manure and fertilisers substantially contributes to wide spread land drainage and eutrophication. Another problem arises due to acid deposition through volatilisation of ammonia. The impact is more serious because of its diffuse character, compared with other activities. There is hardly any part of the country that is not subject to the influence of water management in some way: keeping this in mind increasing attention is being paid to the prospects of agricultural optimisation and reduction of environmental impacts, in order to develop feasible alternatives that deal more specifically with agro-hydrological demands and fertilising. This is supported by the development of hydrological systems analyses and eco-hydrological approaches (Molenaar 1990: 275-304).

Alongside, environmental legislation is becoming stricter: for example, the maximum amount of fertiliser used, and the period during which it can be applied is legally defined. Such measures are implemented so that physio-chemical norms of the external environment are not violated, for example the maximum allowable concentration of nitrogen in the groundwater (Clausman and Melman 1991: 205-210).

Integrated Water Management

Integrated water resource development and management in The Netherlands is a task for the public authorities and not for private bodies and this is a conscious political choice (Siefers 1993: 23). Within the framework of legislation for water management, statutory regulations were developed to solve problems only with respect to different aspects of surface and ground water management. However, the highly differentiated framework of legal regulations includes the following hindrances with regard to an integrated solving of problems:

- Each statutory regulation has its own features, aims, powers depending on the period in which they were developed;
- Mechanisms to co-ordinate the statutory regulations among various fields of water management are either lacking or are insufficient;
- The statutory regulations are too much concentrated on strategic rather than the operational level.

Different measures have been taken, against this background, to promote coordination between statutory regulations. An important development in this direction is The Water Management Act (1989) which provides integration among various segments having interest in or consequences on water. Further, non-legislative mechanisms have also helped in obtaining co-ordination among various agencies. In fact, inter-administrative co-ordination has improved in recent years via non-legal provisions (e.g. integrated area oriented planning) (Perdok & Wessel 1998: 345).

There are a large number of organisations that are involved in water management in the Netherlands. *Figure 2.1* provides an indication of the task and competencies of different organisations. There seems to be not a clear-cut demarcation in the areas of responsibilities of various organisations involved. As a result of it conflicts can be caused over the competence. Conflicts may also come on the way when secondary goals of an organisation which may be concerned, for example, with maintaining the status of the organisation take precedence over primary goals to contribute to the preservation of properly functioning water systems. This may happen particularly during consultations between two organisations where each wants to preserve its organisational goals (van Rooy 1995: 36)

Public Participation and Conflict Resolution

There are several ways and means in a parliamentary democracy like the Netherlands of controlling the executive and administrative agencies. In this respect the role of the news media, radio, TV and press, as well as constitutionally guaranteed right of petition need to be mentioned. In addition, for redress of his grievances against the administration, a citizen can also take up the matter with a Member of Parliament who can question a minister in the Parliament. In the Netherlands, there is a special procedure before Commission of Requests of both houses of Parliament; and a National ombudsman is empowered to hear complaints against the public agencies/authorities (Wessel and Ybema 1993: 388-389).

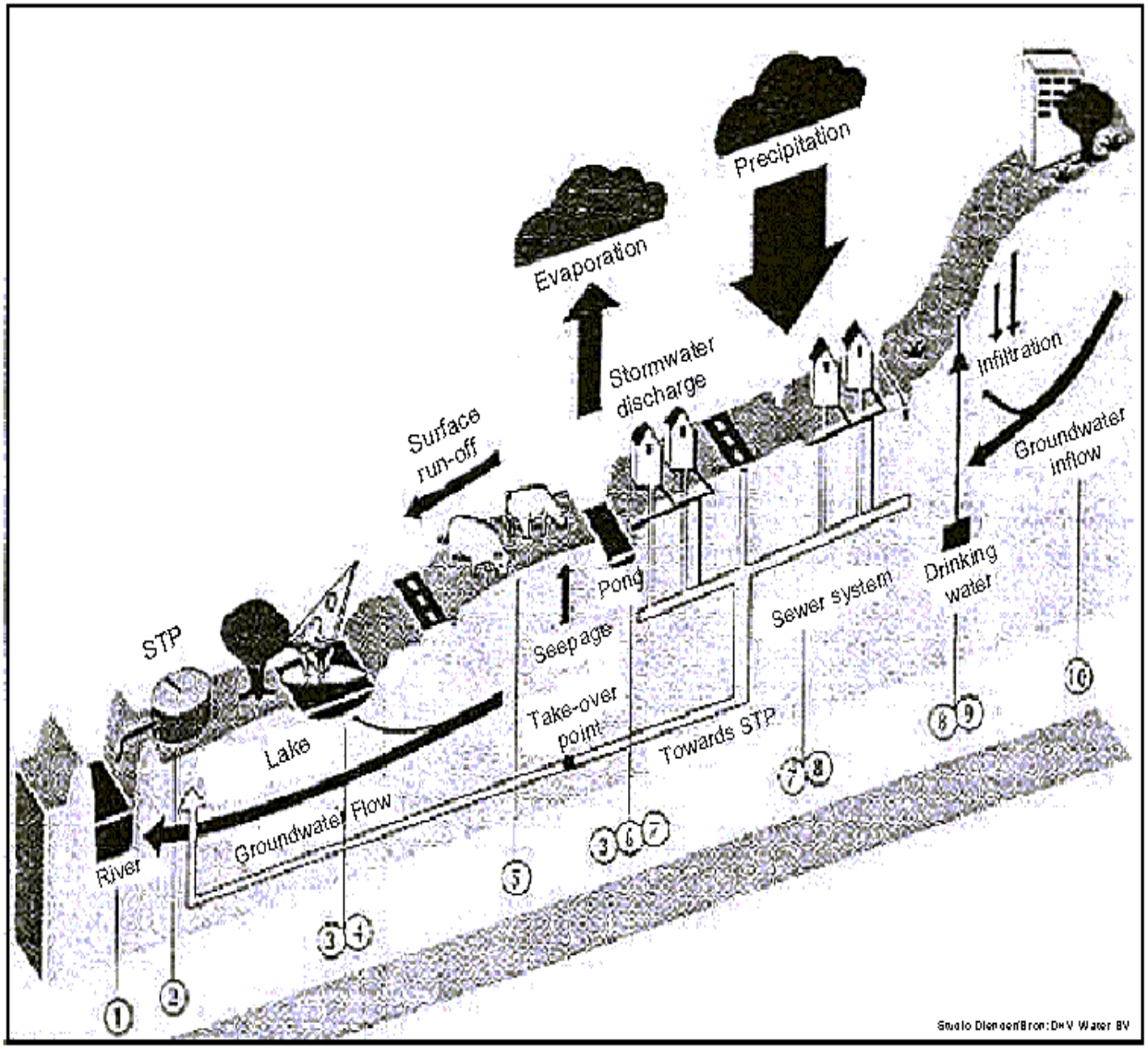
In seeking protection against administrative action the individual can often apply to ordinary courts. On January 1, 1994, new rules for the competencies of courts were introduced and new courts established. Decisions taken by the administration can now be taken to the first level of the ordinary courts, which now have established specialised administrative chambers. According to these rules, before taking a case to the court, an appeal has to be made to the decision-making authority. After the authority has rejected the appeal, the case can be put before the newly established chamber for Administrative Justice of the

Council of State. In some cases it is possible to approach this Department directly e.g. in appeals against the decision of the provincial executive to give its approval to a certain municipal land-use plan.

In addition, in the Netherlands there is a long tradition of settling technical disputes out of court. There are specific types of arbitration for the architects, the building industry and other branches. Many disputes – for instance between a municipality and a water-board – are settled by one or three arbiters. In respect of public awareness and participation, the Dutch government plays an active role in stimulating a more environmental friendly public awareness. Radio, TV, billboards, etc. are used for this purpose. A more indirect way of stimulating public awareness is the subsidising of NGO's like environmental organisations, and research carried out by institutes/centres of eminence.

Public access to information is guaranteed through the Government Information Act. The Act expressly defines under what circumstance information can or must be withheld. Further, the National Ombudsman has the power to investigate acts of public authorities. A citizen has the right to request the Ombudsman in writing to investigate the way in which an administrative body has acted in a particular case towards a natural person or legal entity within one year of action. Since January 1, 1994 the Ombudsman also can investigate the water boards.

Figure 3.1: A cross-section of a fictitious area with an indi cation of the organisations involved in the policy and /or management



Ministry of Transport, Public works and Water Management; District water board or Water purification board; District water board (and Water purification board); Recreation board; Ministry of Agriculture, Nature Management and Fisheries; Angling Federation; Municipality; Ministry of Housing, Physical Planning & Environment; Waterworks; Province

Reproduced from Rooy 1996: 36

To safeguard environmental interests, environmental impact assessment (EIA) is a very useful mechanism. EIA is the process in which the effects on the environment of a proposed activity are predicted and described. The document in which these effects are described is called environmental impact statement (EIS). In respect of drainage projects EIA is required for reinforcement and construction of dikes, land reclamation projects and structural lowering of water level of surface waters (if more than 16 cm). Legally speaking, the decisions requiring EIA is either the granting of permits or the approval of a plan (Perdok and Wessels 1998: 388 – 394)

Subsidiarity

It implies "that authority requires democratic legitimisation, that authority should be built up from the bottom and can not be imposed from above, and that authority should be exercised as close to the citizens as possible" (Brinkhorst 1992: 3).

In the Netherlands, subsidiarity needs to be understood not as a constitutional principle for the division of competencies, but as a principle guiding the consensus-building process under the concept of shared responsibilities used in the Fifth Environmental Action Programme (Kraemer 1998: 401).

At present, the government does nearly all water management. Central government sets the framework which is subsequently filled by the lower level governments, both "general" (provinces and municipalities) and "functional" (water-boards). Water management is institutionally separated from environmental management, land-use planning and agricultural policy, but much co-ordination takes place. NGOs participate extensively in water management, but they do not fulfil public functions on their own. Individual water users are less influential, but they too can participate. In future the allocation of tasks and competencies will change. Water-boards managing water quality and water-boards managing water quantity will continue to merge. It is expected that the water-boards will get more competencies in ground water management although allocation of tasks and competencies is not determined sole ly by the notion of sustainability.

However, it can be postulated that three criteria should be met for allocation of tasks and competencies in order to promote sustainability. These are: (I) all aspects of sustainability should be given due attention, (II) allocation of tasks should be simple and transparent and (III) the bodies to which tasks and competencies are allocated should possess the necessary capacity. Judging the Netherlands from this point of view, it is found that Dutch water management meet the three criteria reasonably well (Mostert 1998b).

DRAINAGE INSTITUTIONS IN FRANCE

Introduction

There are three French terms, which cover the spectrum of different drainage activities. The first, *'le drainage agricole'* refers to all operations designed to remove excess water from a field and especially through underground drains. It is broadly equivalent to the English term 'field drainage'. The second *'l'assainisement agricole'* is a broader concept which refers to the process of transferring water from drained fields to the main river or other outlet through a network of ditches, channels, streams etc. Some works on large rivers may also be included in this category which broadly corresponds to the English term 'main drainage'. Finally river works, whether capital schemes or maintenance are referred to as *'l'aménagement de rivière'*, which covers a large part of what is meant by 'arterial drainage' in English. Both *le drainage* and *l'assainissement agricole* can be used in a general sense to describe the drainage of a large area, and on some occasions the words are used almost interchangeable (Mermet and Mustin 1984: 25).

Legal Basis

In France, water law has been settled at the national level and broken down in two categories for over a century (1898 framework law). According to it water is either appropriated, or subject to regulation of its use. The first group is split between public and private water. Public waters are the major rivers: back from the absolute monarchy, 'navigable and floatable' rivers (*domaniales rivers*) belongs to the Central State (bed and water; banks belong to the riparians but are subject to easements and eventual rights of way). Other rivers can not be privately appropriated, and the use of their waters must be shared by the community of riparians. It is a legal principle derived from Roman law which had been first discarded under Napoleon's code, and was reintroduced officially with the 1898 framework law on water regulation and sharing.

However, in general, The Board of Riparian Owners created by the law for the management of non-domain rivers did not develop leading to poor river maintenance. To remedy the situation, the 1964 framework water law created an intermediate category of rivers between domain and non-domain to be maintained by private contractors. This led to development of contractual approaches in many areas with the support of the Ministry of Environment, and of the basin authorities created by the 1964 law to stimulate solidarities through economic incentives. The most recent law voted in 1992 derives from this evolution. It leaves the ownership rights untouched, but limits their significance, since it unifies all categories of waters under the nation's common heritage – a concept close to the notion of public trust. Two types of plans, the SDAGE at the six agencies level, and the SAGE at catchment or sub-basin level, are supposed to materialize the allocation of water resources among various categories of users (Barraque *et al* 1998).

Institutional Framework

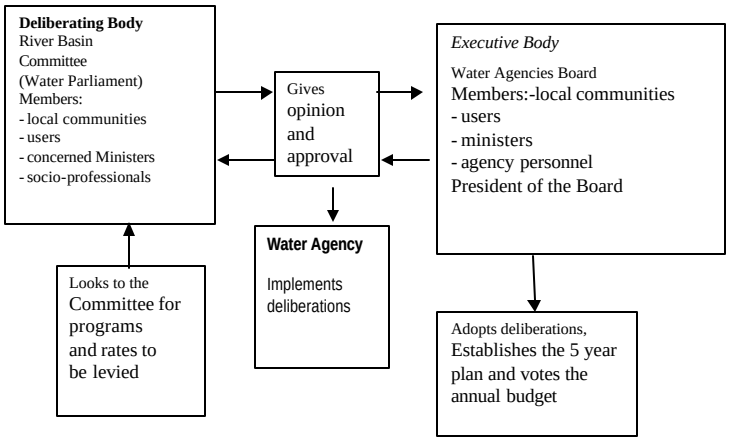
France is a centralized democracy with traditionally two entities bearing sovereignty: the central state representing the nation and the municipality representing the assembly of local citizens (the commune). The prevalence of communes can be traced back to the French Revolution of 1789.

The institutional arrangements for water management in France are very complex, with geographically different approaches and many overlapping layers of responsibilities. As a result, the boundaries between the various levels of government, public agencies, companies and local water management organisations involved with water management are indistinct and intermingled. In recent times, in 1964, the first national water law was enacted bringing water under the public domain, although navigable rivers had been under the control of the state since the early 19th century. At present, the management of water resources is the responsibility of the Ministry of Environment, which supervises six river basin agencies (*agence de l'eau*) covering the whole country. However, specific tasks are delegated to many other ministries. For instance, The Ministry of Agriculture takes care of rural areas, irrigation, drainage, fisheries and river quality. In addition, there is the National Water Board that advises the government on water management policies and it contains representatives of all parties. The six basin-level agencies, established in 1964 as autonomous public authorities, determine water policy in their respective hydrogeographical regions, are financially self-sufficient and co-ordinate all water management actions at regional and local level. Through their basin committees, stakeholders and local water management organisations are represented (Brussel 1998: 73-74).

France is divided into six major river basins, each with its own Basin Finance Agency. These are concerned with the financial aspect of water supply, waste waters and pollution control but have little involvement with drainage. Below the basin level, there are 22 regions and at this level there are a number of bodies or officials concerned with drainage. At the lowest level there are 96 departments which directly administer both drainage and river works.

The legal structure of the 1964 Water Act entrusts water management to the water users of the basin who constitute the Basin Committee: representatives of territorial committees (county, councillor, and mayor), water users (farmers, industrialists, fishermen), the state and environmental protection associates. In each Basin Committee, the elected representatives and the water users jointly decide about the policy issues pertaining to the basin. After consulting regional, county and local councils, it elaborates and adopts a master plan for water development and management [SDAGE] (Nagraj, 1999).
Various actors at different levels (Figure 4.1) handle water management in a participatory way.

Figure 4.1 Water Management in France



Reproduced from Nagraj 1999: 194.

Within the Ministry of Agriculture is a Directorate of Planning with which the *Service de l'Hydraulique Agricole* is responsible for agriculture's water needs, including drainage. This body is in overall change of drainage activities placed at the apex of a pyramid of which 96 *Directions départementales de l'agriculture* (DDA) constitutes the base.

Drainage at Local Level[10]

The emphasis of field drainage policy is on collective efforts. Collective work is supervised and substantially funded and highly encouraged by the state. In order to organize field drainage on the appropriate scale, the DDA encourages farmers to form local associations. Association syndicates are formed purely for the purposes of establishing and maintaining a drainage scheme. Once such associations acquire legal status (equipped with an elected council) most often as *associations syndicales autorisees*, they become eligible to receive finance but at the same time come under the control of DDA and Ministry of Finance (Mermet and Mustin 1984: 29 – 33).

In France, there are two types of local irrigation and drainage organisations:

- The *Wateringues* (Polder Boards) in the north and north-west, since the twelfth century.
- The "*Associations Syndicales d'Agriculture*" (Irrigation Water Users' Associations), mainly in the south, dating back to the twelfth century.

The *Associations syndicates d'Agriculture* (Irrigation Water Users' Associations) are normally initiated by local farmers. The size of the WUA can be from several hundred hectares to more than 5,000 ha. Normally they have their own source of irrigation (well, river, reservoir). Those which are incorporated within the territory of the rural development company derive their water from the development company upon request. All farmers within the proposed perimeter are entitled to a vote. With 2/3 landowner and ¾ land area majorities (or *vice versa*), the association is established. Water rights and thus membership are related to the land not to the owner as a person. Similarly, payment of water delivery fees is by area and compulsory for all land, whether water is used or not. Irrigation associations are eligible to government subsidies and technical assistance. The public tax controller, who has to approve the accounts, is also responsible for fee collection (Brussel 1998).

Nagraj who studied some irrigation organisations in southwest of France where farmer syndicates and regional companies worked in collaboration found that the setting of the irrigation water price was done through negotiation between the management and the user representatives. According to him the many lessons can be drawn from his study which are relevant to India (Nagraj 1999: 203-205).

Wateringues are a highly specific and interesting form of local organisations for water management, located in the north-west of France in the delta of the river Aa. Before human intervention this delta was a wetland covering some 100,000 ha and separated from the sea by natural dunes except at two points (at Gravilenes where the Aa empties into the sea and at Nieuwpoort where the Yser connects with the sea). The general elevation of this wetland was at or below sea level, entailing that it would flood at high tide and drain during low tide. To drain this wetland a decree was issued by Philippe d'Alsace, Count of Flanders in 1169 stating that those who drained the land would become its owners. This decree also created the *sections de wateringues*, local water management organisations comparable to the Dutch Water Boards made up of all the owners of land in a section. During the French Revolution the *wateringues* were disbanded, as the landowners wanted the state to pay and manage drainage and sea defence, but reconstituted in 1806 through the law on the *wateringues*.

Until thirty years ago the *sections de wateringues* operated relatively autonomously and ensured land drainage in their areas. The *wateringues* have been financially self-sufficient since 1169 and an elected board manages each section. All landowners, both public and private, owing more than 4 ha have the right to vote, while farmers owning less land can form a fraction and mandate one of them to vote as a

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[10] Section 3.4.3 to 3.4.6 are based on a note prepared by Mr. Flip Wester who accompanied the author on a field visit to France during July 17-18, 2000.

representative. The municipality represents urban dwellers. The mandate of the *sections de wateringues* has always been straightforward, namely to control the water level in the *sections*. The drainage network consisted of a fine maze of field channels and collector drains that empty out onto the *watergang*. These in turn drain onto the river Aa, controlled by the French state for river navigation since the early 19th century. As a result, conflicts between agriculture and navigation were common until the 1960s, when pumps were installed to drain the *watergangs* onto the river. Before the installation of the pumps drainage was only possible at low tide.

At present, there are 12 *sections de wateringues* each with its own management board. In the 1960s these *sections* formed the *union de wateringues* to obtain subsidies from the European Economic Community for the construction of the pumping stations. The chairman of the union represents the *wateringues* in other water bodies. In the 1960s three main pumping stations to the sea were constructed. These are controlled by the *Institution Interdépartmentale des Wateringues*, created in 1977 by the General Councils of the Department of Pas de Calais and Nord. A third important actor for water management in the *wateringues* area is the *Voies Navigables de France* (VNF; French Navigation Routes), a central government agency charged with managing France's rivers. The *wateringues* as well as the *Institution Interdépartmentale* have contracted the VNF to operate the pumping stations. The budget of the *Institution Interdépartmentale* is around 7 million FF, which is government money, while the budget of the *sections de wateringues* is 16 million FF, generated from water taxes paid by all the landowners with land in the *wateringues* (in the order of 100 to 200 FF/ha).

Interestingly, according to the Chairman of the *union de wateringues*, the *wateringues* were not consulted during the formulation of the regional water management plans by the *agence de l'eau*. In addition, the *wateringues* have increasingly come under attack from residents, who are reluctant to pay the *wateringues* tax and feel that it is an outdated organisation. Lastly, the environmental lobby is arguing that wetlands should be restored in the area, making the *wateringues* redundant. Thus, this 820-year-old institution is coming under increased attack, and has been effectively encapsulated by the government in the past thirty years. While the French water rhetoric places strong emphasis on stakeholder participation and representation, at the same time autonomous water management organisations are being weakened. It will be interesting to see if the *wateringues* will continue to play a role in water management in the future or whether they will be co-opted by the French state under the guise of stakeholder participation.

Following are some of the other features of the *wateringues* which came to the author's notice during his field visit in July 2000:

Wateringues have been levying taxes on farmers on the basis of article 13 and 14 of the Royal ordinance of January 27, 1837 as amended on September 12, 1969.

Wateringues have been concerned with the management of water levels, unlike Dutch Water Board who also manage quality of water.

Each section is a catchment based administrative entity and is administered by a democratically elected body. Each section elects a varying number of administrators, for instance, while section 7 elects 17 administrators, section 3 elects 12 administrators. The administrators from amongst them elect a President, a Vice-President and a Secretary. Administrators are elected for 6 years but 50% members retire every 3 years. This gives the management continuity. Voting right varies between 1 vote to 10 votes. A farmer with 1 vote in section 7 presently pays 1450 F per annum and those with more votes have to pay in the multiple of that amount (see Annex 8).

According to the President of Section 3 who also happens to be the President of the Union of Wateringues, more and more families are leaving farming as their children prefer other occupations. He

told that today 6 farmers remain … where 40 farmers cultivated 50 years ago. According to him, although farm size has considerably increased, it has become difficult to live off through farming alone.

Farmers have shifted from surface to subsurface drainage because of the subsidy they got from the EU and the department.

Although *wateringues* are nearly 800 year old institutions it is intriguing to find that they did not have their own office buildings and operated either from farmers houses or from other public offices. For instance the Office of Section 3 was located in the chairman's house (even the Union of Wateringues Office was in his house) and those of section 1 and 7 were located in Dunkerque port office and Navigation Office respectively.

Funding for Drainage

There is substantial amount of public funding both for field and arterial drainage. The finances are derived from several different levels of administration. Schemes submitted to the DDA for funding vary from purely field drainage proposals to relatively large river improvement schemes but the basic procedure is same except for the largest. Although the chief engineer has considerable discretion, subsidy levels were set by the Ministry of Agriculture in 1972 and 1979. For river works, a range of 20 – 80 per cent was permitted and the recommended subsidy was set at 50 per cent. For river schemes containing an urban as well as agricultural element, the DDA would be expected to contribute also. However from agriculture budget 30 per cent is recommended.

In case of provision of ditches and channels for moving the water from drained fields to river outlets, the subsidy limit is 30% to 80% and the recommended level is 60 per cent. The policy as indicated in the preceding is to actively encourage collective works (works of the type mentioned) involving drainage. In addition, grants are available from local farmers' co-operatives for the purchase of drainage equipment.

Another source of funding is *Credit Agricole.* This semi-public organization provides 70% of all their credit to farmers on lower interest rates. Further for many purposes subsidized rates are also available to farmers. (Mermet and Musting 1984: 33 – 38).

The water industry has a turnover of 100 billion francs each year, employing about 100,000 persons. This turnover comes from consumers, public subsidies fed by levies and private investment. Consumers pay about 80 billion francs each year for water. *Table 4.1* provides a summary of the purposes for which this money is utilized.

Table 3.5 Collection Agencies, Amount Collected and the Purpose

Collectors	*Annual amount*	*Purposes*
FNDAE	1 billion	Investment support to new works in rural communities
VAT (5.5%)	4 billion	State general budget
Water Board	10 billion	Operating budget: 1 billion
		Investment support for new works: 9 billion (from which 7 in water services)
VNF	0.5 billion	Maintaining navigable public ways
Local communities	35 billion	Loan charges: 10 billion
		Direct management operating budget:5 billion
		Loan capital payments: 10 billion
		New investment: 10 billion
Operators	30 billion	Operating services, shareholding, reinvestments and taxes

FNDAE: National Fund for Water Development in Rural Areas

VNF:Public organisation managing navigable public ways

Source: from a draft report (not to be quoted)

Impact of Drainage on Agriculture

In spite of the fact that land drainage performance assessment (PA) is of interest for many drainage practitioners and donor agencies, it is generally an unexplored topic. The papers dealing with PA are marked by an extreme paucity of field experimentation/research. Several regional land drainage PA programmes have been set up in France during the 1980s to evaluate and help the design of the 120,000 ha of sub-surface drainage systems constructed annually at that time.

The assessment of drainage benefits was carried out in France by farmer boards or farmer associations. The selected indicators were mostly crop yields and farmer income increases. In the second case, a common method was to compare the average income of farmer groups having or not invested in drainage. This indicator is rather easy of access but it suffers from unreliability of results as higher income is not necessarily the effect of drainage improvements. However, these difficulties were eliminated in the PA programme based on yields measurements at the field scale.

The land drainage performance assessment (PA) programme was launched in the late 1970s in the French department of *Eure et Loir* located 100 km west from Paris. Yield values were monitored by the technical services of the local farmer board in several subsurface drained fields.

Yield differences between trench and drain mid-spacing location proved to be very relevant indicators of the effect of drainage on yields. If excess water is totally removed of drainage then the differences of yield between the two location should be very little. Differences of yields between two fields can be attributed to drainage if they are comparable to the differences between trench and drain mid-spacing locations in the field with lower yield value. The results thus, demonstrated that the differences in yields between the two spacing are related to drainage (Zimmer 1996: 64-66)

Integrated Water Management

In France, like in England, initial move towards a more holistic and sustainable water policy took the form of a regionalisation. The French experience was founded upon the creation of a new and supplementary regional tier for water management. The establishment in 1970 (following the 1964 Water Act) of the six basin level agencies has been hailed as an innovative and unique initiative within Europe.
Lying at an intermediary level, the agencies play a very important role. Empowered with no statutory regulatory functions, they were set up as financial investment agencies benefiting from, what was at that time, an important new fiscal regime. The 1964 Act introduced mandatory charges (which vary according to the nature and abundance of the water resource), linked to abstraction and discharge permits (accorded by State regulators). The money from these is allocated directly to the agencies which then reinvest in local authority or private water management schemes that are seen as contributing to pollution reduction or more efficient water use. In this way, these basin agencies have emerged as central players in redistributing the cost of water quantity and quality management and negotiating more balanced water use through financial incentives to water users: higher emission quality or more efficient water use being rewarded by lower discharge or abstraction levies and demonstrable progress towards improvements being rewarded by the possibility of loan subsidies.
The importance of basin agencies lies less in their innovative fiscal approach to negotiated water quality management than in their regional focus. At one level, the division of national territory into six major river basins followed on from an implicit concern, during the period of postwar economic expansion: first, for identifying and distributing the real economic costs of water management and pollution control more effectively and second, finding a fiscal alternative to the largely ignored centralized regulatory regime. At another level, the major river basins offered a new geographical dimension that possessed a number of attractive features. They were not linked to a pre-existing tier of local government, they facilitated a broad approach to both water quality and water quantity management (including flood control) and they were sufficiently large to generate appropriate levels of fiscal revenue (Buller 1996: 291-292).
An important feature of water management in France is catchment planning. The local level plans (SAGE) and the broader water resource plans (SDAGE), established under the 1992 Water Act, follow a two-tier tradition already well established in French land use planning. A large scale forward planning document is established at the regional (basin) level in case of SDAGE which identifies broad trends for integrated water management of water resources for 10 to 15 years period and locates zones where potential investment or more detailed planning is needed. At the local level, a more precise planning document seeks to harmonize the roles and needs of different private and public actors by identifying and evaluating the current state of water quality and quantity within a catchment, and by setting out specific management options and more detailed assessment of future actions (SAGE).
Apart from their scale, SDAGE concerning the major drainage basins of France, and the SAGE focusing on coherent local hydrographical structures, the main difference between the two documents lies in their juridical status. While the regional documents are obligatory and had to be published by January 1997, the SAGE is discretionary, emerging from local political will rather than central dictate. Both documents involve elaborate public participation exercises, bringing together water users, consumers, regulators and policy makers, the SDAGE through the existing Basin Committees, and the SAGE via the new local water commissions (Buller, 1996).

Public Participation and Conflict Resolution

In France when new constructions or rehabilitation of existing systems is planned, there are usual procedures of public enquiry, but they are rather formal and do not attraPct many people. Some local authorities open the discussion process more regularly through *commissions extra-municipales*, where councillors and municipal staff of the normal commissions invite all people who may be interested in the discussion. The decision power however, remains with the council. The water law of February 6, 1992

provides for consultative user boards of local public services, which are slowly developing. Another 1994 law demands the yearly publication of a financial report of water services (Barraque 1998: 138). In France, consumer associations remain separate from ecologists and environmental movements, but they sometimes contribute to the growing citizens consciousness. For example they have played an important role in revealing the excess of nitrate in many drinking water networks in 1992.

At the local level many ecologist associations exist in France, They are federated at the region or department levels, and many of those which include earth scientists dedicated to ecology are grouped in a national federation (France Nature Environment). The role of fishermen's and environmentalist associations is generally increasing, and will continue to do so because the law of 1992 have given them legal standing in the courts for environmental protection enforcement.

Elected representatives have created several associations to inform themselves and to promote better environmental practice. In the specific field of water policy, non-partisan associations of elected representatives allow for their permanent education. For example *Circle français de l'eau* is typically a kind of forum where elected representatives' associations (association of French mayors, national association of sea-side communes' mayors, association of regional councilors, of department presidents) meet representatives of various water trade associations (Barraque *et al* 1998: 141 – 142).

As regard conflict resolution, like other countries in Europe, the court provides access to all. However, the French Court system is dual, and slow. Dual because injunctive relief can be sought in the administrative court, while damages are eventually granted by the civil court. On an average, 8% cases are abandoned for lack of evidence, or formal problems. 17% lead to penal indictments, and the 75% others are solved through transactions, including payment of liabilities and remediation. This occurs mainly on non-domain rivers, since other agents in charge of the water police on navigable water ways do very little enforcement as a matter of fact (Barraque 1995: 136 – 137).

Subsidiarity

Subsidiarity is not applied as a constitutional principle in France even though sovereignty is enjoyed both by the Centre representing the nation as a whole and municipalities (communes). In France, centralism of policy – making is combined with extreme decentralisation of decision – making in the communes.

In relation to water management, France has established six largely autonomous river basin institutions. These operate with the involvement of water users (industry, municipalities, and farmers) and dispose of budgets, which are independent from the central government but require parliamentary consent. In the light of the contents of Section 3.3.3 and Figure 4.1, water agencies can be seen as an institutional embodiment of subsidiarity in its functional sense, made possible by the absence of subsidiarity in the constitution of the French Republic.

In contrast, in Germany, subsidiarity underlies the federal structure of state and government and is applied prominently as a constitutional principle. On one hand, it provides a safeguard for local autonomy and statehood of the *Länder*. On the other hand, it is applied in an institutional structure and in combination with legal principles which favour integration over co-operation. The resulting emphasis on integration is in contrast to the tradition in France. (Kraemer 1998: 402)

Drainage in Institutions in Germany

Introduction

The institutional framework of drainage as it exists today in Germany is the product of developments in both water management and water engineering. Quantitative management of water is historically the first important water management function requiring large – scale technical infrastructure even on a regional scale: flow control, flood defence, drainage and irrigation. The purpose was to increase and maintain the productive capacity of agricultural land so that its value is enhanced. Since the economic benefits accrued to landowners and the benefits of flood protection to the inhabitants of the managed areas, voluntary or mutually enforced cooperation by these groups was possible. This led to the establishment of local water management bodies and rules and regulations governing them as early as the thirteenth century (Kraemer & Jaegar 1998: 214, Brussel 1998:75).

In the twelfth century, in North Germany, extensive use was made of the Dutch knowledge of water management. The Dutch had acquired this expertise with the reclamation of peat areas. The first batch of reclaimers came from the surroundings of Leiden. The expertise did not consist only of technical knowledge, but also of the administrative organization of the free village communities. The Dutch reclamations in the North German Plains in the 12th century constitute an outstanding success. German authors even speak of an explosion of reclamations. The areas reclaimed by the Dutch at that time consisted of an area in the valley of the Weser and large areas along the river Elbe. However, it should be clearly understood that not all reclamations in the soggy areas in North Germany were carried out by Dutchmen. After the 12th century, the German people themselves carried out much reclamation but they utilized Dutch engineering skills. The reclamation of marshy grounds in North Germany, in particular, continued during the period 1250 – 1600 A.D. In the seventeenth and eighteenth centuries, Dutch activities in Germany were confined mainly to the region of Schleswig – Holstein.

Finally, it needs to stressed that the system of dry peat cutting and the subsequent rise of the peat colonies was exported to Germany. In 1630, the first settlement, Papen – in East Friesland – was founded where peat cutting was done the Dutch way, i.e., via a system of main canals and side canals. In the construction, Dutch investors, engineers and surveyors played an important role. In the later peat – cutting activities, Dutchmen were also involved, but gradually the local population took over.

Legal Basis

The current legal framework for water management and planning in Germany was established fairly recently and is the product of the transfer of limited legislative competences from the *Länder* to the Federal Government in 1957 and the development in European water legislation since 1970s. In Germany, directives and regulations concerning water management are part of the competence of the European Community.

Länder refers to one or the whole body of 16 states which together constitute the Federal Republic of Germany. The Weseran *Länder* have constitutions which pre-date the federal constitution, the Basic Law (Grundgesetz); the eastern *Länder* of the former German Democratic Republic adopted constitutions after the German reunification of October 3, 1990, based in part on their historical predecessors. The federal Constitution recognizes the eminent role of the *Länder* and guarantees their statehood and

autonomy. This constitutional guarantee is absolute in the sense that this basic feature of the Constitution cannot be altered in any way.

For hundreds of years, Germans lived in many separate states, one of the most powerful of which was the kingdom of Prussia. During the late 1800's, Otto von Bismarck, the prime minister of Prussia, united most of these states and cities under Prussian leadership. As a result, until not so long ago, different laws were in force in different parts of Germany. Water laws dating back from the late 19th century and early 20th century were in force prior to 1957. In Baden – Wurttemberg, for instance, The Baden Water Act of June 26 1899, The Wurttemberg Water Act of December 1 1900, The Prussian Water Act of April 7, 1913 and various Hessian laws as well as other minor legislation applied to different parts of the land depending upon which previous state they had belonged to. Only The Prussian Water Act was common to large parts of Germany. The Federal Water Management Act (Wasserhaushaltsgesetz – WHG), which had been in operation since 1957, has provided the legal framework for all *Länder*.

Water policy is one area where the competence of the *Länder* is most pronounced and this is of paramount importance for the institutional mechanisms of water management. The German *Länder* have legislative powers to the extent that the Constitution – the Basic Law – does not grant to the Federal Government. In relation to water management in general, the Basic Law empowers the Bund[11] merely to adopt framework legislation. In the area of concurrent legislation, which includes water management functions such as promoting agricultural production., public water supply or navigation, the *Länder* have legislative power as long as the Bund does not enact legislation. The Bund has the exclusive right to formulate legislation in respect of certain areas

One water management law falling within the Bund's sphere of competence is The Water and Soil Association Act (Wasserverbandsgesetz – WVG.) The Act provides the legal framework for property owners, companies, public law corporations and other interested parties to establish self – governing consortia for land and water management purposes which sometimes cover large land areas. (Kluppel 1991, Dirksen & Lubbe 1992)[12] On its coming into force on May1, 1991 (adopted on February 12, 1991) the Act superseded the Act on water and Soil Associations of 1937 which in turn had replaced ancient customary practices and many different land and water association laws to provide an act common to the whole of Germany. As a matter of fact, the 1991 revision provided the modernized framework for the new *Länder* of the former German Democratic Republic.

Federal water management legislation consists mainly of the Water Management Act[13] providing a general legal framework for the *Länder* legislation and Effluent Changes Act (first adopted on May 20 1976 and as revised in November 3, 1994) setting economic incentives for reducing water pollution and providing financial resources for water resource protection measures. A large number of federal ordinances, administrative instructions, etc. are based on the Water Management Act. The act is designed to work in conjunction with the water laws of the *Länder* which fill in the framework it provides. (Kraemer & Jager 1998: 183-199)

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[11] Bund refers to Bundesrat, the Second Chamber of The Federal Parliament consisting of representatives of the Länder governments.

[12] See Correia *et al* Vol. I p. 199 for the details of the reference.

[13] It was adopted on June 27 1957, revised on September 23 1986 and amended from time to time.

Institutional Framework

The broad framework of institutions and functions in respect of water management are presented in *Figure 5.1.* However, on the government side, a distinction can be made between institutions with direct or indirect executive power (sovereign regulatory authorities) and institutions which perform technical functions such as planning and monitoring (providing technical basis for the government agencies).

At the federal level, sovereign functions are performed by the federal ministries and partly by the delegations to federal agencies or institutes which normally report to one federal ministry but carry out tasks for various ministries. However, the systematic separation into sovereign authorities and technical agencies is to be kept in mind for the characterization of institutions at federal level.

At the *Länder* level, water management institutions are of great importance. As mentioned above, competence with regard to water management is primarily located in the *Länder*. All *Länder* except the city – states of Berlin and Hamburg have authorities supported by technical agencies. Further, competence for water resource protection and management are in respect of most *Länder* allocated to several levels of government normally following the structure of administration. The precise allocation of various water management functions varies considerably among *Länder*, as do the number of levels and individual institutions. Generally, the decentralization of administrative structures increases with the size and population of a Land (*Länder*). Within this broad framework, Environment Ministries have overall responsibility for water management.

An institution, which is highly relevant in matters of water management, is *Länder* Working Group on Water (LAWA). LAWA was founded in 1956 by the *Länder* governments and has an important co-ordination role. As a result, various approaches in policy and legislation concerning water management have been harmonized and coordinated through inter-governmental co-operation. This co-operation has brought a convergence of water resource protection and management as well as the reporting procedures. This is despite the fact that LAWA decisions and recommendations do not have the force of law. (Kraemer & Jager 1998: 185, 204-207)

The federal Ministry of Food, Agriculture and Forestry is responsible for the control and supervision of irrigation and drainage development of national importance in the country. In most states (*Länder*), there are Ministries of Food, Agriculture and Forestry; in some states the name of the respective ministry has changed, but the responsibilities are more or less the same. They seek approval of the Federal Ministry and increasingly of the European Union too, if subsidies are needed. Each state is divided into regional districts (Regierungsbezirke), the administration of which is usually responsible for water allocation and providing subsidies and advisory services to WLAs. (Wolff *et al* 1996: 15)

Drainage at Local Level

In Germany, the use of water resources, the maintenance of waterways and the protection of man from water as a force of nature is mainly carried out and managed by WLAs which are formed by interested or beneficiary land owners. WLAs are statutory public bodies that manage themselves but are supervised in fundamental matters by their respective governments. They are service and non – profit organisations. In 1997, it was estimated that there were more than 18, 000 such associations dealing with – among other things – water management, mainly in respect of drainage and maintenance of smaller water courses. As mentioned above, WLAs are public legal entities , as their task is that of a public authority (Wolff & Konig 1997: 217) such as drainage, irrigation, drinking and waste water.

The roots of WLAs can be found in the 13th century when people started to work together for the purposes of flood protection. (Brussels 1998: 75, Wolff & Konig 1997: 217) As mentioned above, in 1991, the new law concerning WLAs was enacted[14] which replaced the regulations of 1937, based on the historical experience of farmers in respect of water resources, flood protection, drainage and irrigation works in Germany. WLAs have been traditionally active in implementing rural management goals and the measures required to achieve these goals as well as in operating the necessary structure and facilities. In the post – World War II era, these associations served primarily to secure a sufficient supply and to improve production conditions. Today, their range of tasks has grown to include those regarding nature and landscape conservation as well as leisure and recreation. The new law sets new environmental policy standards by opening up opportunities of giving WLAs new rural duties. The establishment, preservation and maintenance of areas, facilities and water bodies to conserve the ecosystem and the soil as well to tend the landscape deserve special mention. In addition, the act grants the WLAs a far-reaching right to self-administration. For example, freedom to draft by-laws is granted. The form of the competencies of the board of directors, the committee and the general assembly is worded in reverse order vis-à-vis the previous version. Thus, the decision making process in the associations is to run along democratic principles. (Water Association Act 1991: 405) Thus by means of 1991 revisions, associations are awarded enhanced responsibilities and organisational freedom, which entitles the user of defined landscapes and river catchment areas to organise their production fields jointly with self-reliance and with added ecological responsibilities. (Dirksen 1997: 2)

Normally, WLAs are established on a voluntary basis. However, if it is a case of general public interest, a WLA can be established on government initiative against the will of potential members. The WLAs make their own rules and regulations which are ratified by higher authorities. Members of WLA are individual (e.g. farmers) and / or legal persons, public bodies or corporate bodies. Except in small associations, they elect a committee to take care of the daily tasks normally by employing and/or contracting technical personnel (Brussel 1998: 76).

In case of irrigation – farming or in respect of land drainage, the membership is always linked to the usage of land and not to its ownership. In order to guarantee a high degree of continuity in the work of the association, it is usually very difficult to withdraw from the membership of the association. Even if a plot changes hands, the new owner is obliged to maintain membership and his contributions to the association.

The general assembly, constituted by all the members, is a common feature of the WLAs. The matters relating to the rules and regulations of WLAs, contributions of the members of the association, term (period) of the board and chairman as well as other organisational matters are decided by the general assembly. The organisational structure is shown in Figures 5.2, 5.3 and 5.4. The one shown in *Figure 5.2* applies to smaller associations, while the one in *Figure 5.3* shows the set-up of larger organisations. The organisational structure shown in *Figure 5.4* shows umbrella WLAs. (Wolff & Konig 1997: 219 – 222)

Article 2 of the Act of 1991 covers the activities (permissible tasks) of the WLA and the same are mainly concerned with water management. According to this article, WLAs may undertake comprehensive engineering and maintenance measures. (Water Association Act 1991:3)

The performance of the WLAs has in the past been very successful. The reason for this success has so far never been analysed. That is why at the time of Germany's reunification, in the early 1990s, hardly any written material was available which could be used as a guide for the establishment of similar institutions in the eastern part of the country. Experience in Germany shows that an important solution to water-related problems is to give users the responsibility for developing and managing the water resource. This

[14] The enactment of 1991 law was necessary on account of unification of Germany in 1990.

requires that farmers become properly organised in water user associations able to discharge their new responsibilities, and that they have security of tenure to the land they drain, farm or irrigate. (Wolff *et al* 1996: 25 and Wolff and Konig 1997: 232)

Since the 1980s, the maxim that the rivers and watersheds should be managed solely to maximise consumptive use is slowly giving way to a belief that natural resources should also be managed for the sake of environmental values such as biodiversity and social and cultural values. This shift in paradigm is raising a number of questions. The most important being, who is going to pay? Up to now in drainage associations, for instance, the landowners benefiting from drainage work have to be members of the respective association and pay a yearly fee in accordance with the level of advantage that their land is getting from drainage. If as planned, the activities of the WLAs are extended to ecosystem management, which may be deemed as partly or not at all advantageous by the landowners, the question arises who will pay for the activities which go beyond drainage. (Steinaecker 1989)

Local Drainage Associations in Ost Friesland[15]

The whole of Friesland extends from Groningen in the Netherlands to the vast area in the eastern part of Germany known as Ost Friesland. The border area between Groningen and Germany consisted of an extensive peat area functioning as a natural barrier within the area, which was kept wet deliberately for military purposes and a number of defence works were built (de Ven 1993: 142). Originally, Friesland was above the sea level. However, subsequent raising of the level of the sea led the people to build mounds on which to take refuge. This vast swampy region, for a long time, was a wild, inhospitable and unknown lagoon marked with treacherous sandbanks and sea-currents. The only resources were low-grade stock-farming on the schorres, fishing and peat-cutting; cereals were rare and wood unknown. The lack of roads, the hostile environment and absence of towns isolated Friesland from the rest of Europe (Wagret 1959: 54-58).

As mentioned in the introductory section of this chapter, even before 1250 A.D., the Dutch were involved in the reclamation of marshy grounds, particularly in North Germany. These activities continued until 1600 and during this period, the system of peat-cutting was exported to Germany. However, peat-cutting was not undertaken on such a large scale in Ost Friesland (Germany) as in the nearby province of Groningen (West Friesland now farming a part of the Netherlands). In later years, this proved to be a great handicap in the rise of a prosperous rural population in Germany because the farmsteads that emerged after the peat-cutting were far too small (de Ven 1993: 151).

Over the ages, drainage has played a very important role in the development of agriculture in Ost Friesland. However, on account of two recent developments, the primacy of drainage has diminished considerably. These are: firstly, the role of agriculture has lessened and other sectors have gained primacy in the economy; secondly, environmental concerns have led to the adoption of ecosystem approaches which in turn have led to enactment of WLA Act. The act expects drainage associations to take up the responsibility of environmental protection, including preservation of nature by not draining wet areas. Inspite of this, drainage works still constitute the main activity of local farmers organisations. During his

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[15] The author visited this low-lying area long with Mr. Jan-Willem Knegt, a student of the Wageningen Agricultural University during October 9 and 10, 2000. Thus, in Germany also, we were able to visit low-lying areas – a common characteristic of our field visits in the other three countries.

recent field visits, the author examined two such organizations which have been discussed in this section.[16]

Drainage-related activities in the coastal area of Ost Friesland are carried out by two organizations, viz., Landshatts- und Kulturbauverband Emden (LKV) Aurich and Entwasserungsverbande (EVE). Within the area of operational jurisdiction of LKV, which covers 150000 ha, there are five Entwasserungs. These are: Norden, Dornum, Emden, Aurich and Oldersuna. Of these, we visited Emden and the same would be discussed in the subsequent section.

LKV is concerned with installation and maintenance of pipe drainage for individual farmers. EVE's activities extend to pumping water out of the lowlands into the sea, operation and maintenance of pumping stations and main (sea) dyke maintenance. While LKV is "non-compulsory", it is compulsory in the case of EVE for farmers, residents and industries to pay charges in order to cover its expenses.

Landshatts- und Kulturbauverband Emden (LKV)

Historical Background

LKV Aurich was established in 1929. In 1991, it merged with LKV Norden to form today's LKV Aurich. The merger was necessitated by an ever-decreasing 'importance' of drainage and an ever-increasing 'importance' of infrastructural works. After the World War II, there was a strong need for increased food production and drainage was installed in farmers' fields at a rate of 2000 ha per year. Today, this rate is down to approximately 300 ha per year. This sharp decline in the rate of installation implied reduced income for the LKV. To reduce costs, therefore, the two LKVs merged. Furthermore, additional income was sought by focussing on the construction, improvement and maintenance of rural roads etc. Drainage, then, has not lost its importance; sub-surface drains have largely been installed and the focus is now on maintenance and other aspects of infrastructural development.

Present Position and Functions

LKV Aurich, which covers an area of 150, 000 ha is based in Georgsheil in Ost Friesland. LKV's objective is to improve soils for agriculture, among others. One of the tasks that it can perform is the implementation / installation of horizontal sub-surface (pipe) drainage. Another major task in the changed scenario (referred to in the preceding paragraph) relates to infrastructural development. The character of the LKV, as stated above, is 'non-compulsory'; a farmer can request (and pay) the LKV for installation and later maintenance of sub-surface drainage, but can also go to a private firm for the same.

Funding

Financially, LKV Aurich is largely autonomous. Although its origin may be traced to farmer initiatives, it is, today, supported by the income generated through its non-drainage-related activities. All farmers and residents located at an elevation below 5 metres plus mean sea level are obliged to pay the *Entwasserungsverbande* (EV) for 'pumping-out' the water and for maintaining the main sea dykes. Farmers pay around 25-40 DM/ha/year, and residents pay in the range of 5-10 DM/ha/year while industries pay in relation to the value of their properties / area covered. As from 2001, the EVs need to be financially self-sufficient by recovering their expenses from farmers, area residents and industries.

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[16] The section is an adaption of notes prepared by Mr. Jan-Willem Knegt based on his interview with the concerned officials of two organisations in Ost Friesland.

Presently, the EVs still receive some financial support from the *Länder* (Niedersachsen in this case). This support to agricultural drainage is expressed in DM per ha (approx. 10 DM / ha).[17]

Pipe drainage is financed as follows.Implementation of pipe drainage requires, on an average, 1700 DM per ha. This figure includes 16% VAT and another 20% as an initial instalment. The remaining 64%, or approx. 1000 DM per ha, is in the form of a credit to the farmer, who is to repay this over a 20-year period at an interest of 8%. This implies an annual payment of around 90 DM / ha by the farmer.

Organisation

LKV is organised as follows: A *Geschäftsführer* is in-charge of the administration with an office staff of 12 and a field staff of 50 and is responsible to a board ("*Vorstand*") of 11 persons. The members of the board are elected every 5 years and existing members can be re-elected. The board is elected by farmers and residents of the area and always comprises 6 farmers and 5 representatives. The chairman and the treasurer are always farmers, the secretary is always a resident.

Drainage operations

In Ost Friesland, around 50 % of the rural area is "Grünland", i.e., pastures for dairy while the other half is agricultural land, i.e., land for wheat production. The pasture land is drained by shallow and gentle-sloped ditches to carry away surface run-off towards open drains while the agricultural land is drained through horizontal sub-surface drains that convey groundwater to the open drains.

The soil is generally (heavy) clay which is difficult to cultivate when wet. The main reason that could be ascertained for the installation of drains by farmers was that it enabled them to cultivate their fields sooner and made weeding easier (mechanized) etc. This clearly improves flexibility of farming operations and hence suggests a higher potential of agricultural production.

Entwasserungsverband, Emden (EVE)

Historical Background

'*Entwasserungs*' in German means drainage and '*verband*' means association. Thus, the term, *Entwasserungsverband*, refers to a local drainage association which after the Act of 1991 are referred to as Water and Land Associations (WLAs) This Emden-based association was established in 1879. The origin of this association goes as far back as 1801 when *'Pegelverband Emden*' was established. This institution largely served the harbour/port of Emden, by controlling water levels according to the demands made by navigation. With the construction of the Emden-Wilhelmshaven Canal, the area of the Pegelverband was divided and became known as the 1st and 2nd Entwasserungsverband Emden (EVE), which later (around 1879) were named (today's) Entwasserungsverband Emden and Entwasserungsverband Oldersum (EVO). With the split of the area of the Pegelverband, both EVE and EVO re-oriented their drainage. Moreover, agricultural drainage became increasingly important, especially after WW-II when there was a substantially increased demand for food-production in Germany. Throughout the history of the EVE and EVO, the struggle of farmers and skippers has dominated the setting of water levels. This struggle resulted in 1916 in fixed water levels ('Wasserstand') for both summer and winter periods. The levels were documented in the Pruisische Verwaltung (Königliches Deich- und Sielamt No. 415 L). On the basis of the Wasserverbandsverortnung, an Act issued in 1937

[17] The extent of other subsidies received by EVs is not clear.

under the regime headed by Adolf Hitler, farmers were given only obligations and no rights concerning water level control until 1996. In 1991, the Gesetz über Wasser- und Bodenverbände ('Wasserverbandsgesetz' –WVG, a 'Bundesgesetz' or National Law) was effected, facilitating the organisation of Water and Soil Associations. The tasks of organisations dealing with water are regulated through the 'Niedersächsiger Wassergesetz' (from 1970, has been modified several times, last time in 1998).

Since 1998, nature has been prominently valued as a result of pressure by environmental NGOs.

Present Position and Functions

It should be clearly understood that the LKV is a separate organisation that is not organisationally linked to EVE, although the area or jurisdiction of LKV covers the areas of EVE and four other 'Entwasserungsverbände'. People can choose to become a member of the LKV, whereas they are obliged to be a member of and contribute to EVE.

The Area of the EVE covers approximately 50, 000 ha. It is subdivided into 7 sections for administrative (elections), rather than operational purposes. The area of the EVE covers several municipalities ('*Gemeinde'*, '*Kreis')* and the boundaries of the seven sections are based on the boundaries of these municipalities; All landowners (title holders, who number approximately 25,000 people) and leaseholders in the area of EVE are automatically members ('Mitglieder') of EVE, whether they want it or not, i.e. every landowner is expected to receive benefits of EVE and is expected to pay for EVE's services accordingly.

EVE's main tasks are the maintenance of the open drains of the second order (removing weeds and dredging), the discharge of water from the area through the operation of small and large pumping stations, and the maintenance of the sea dyke.

Funding

EVE is supposed to operate as a financially self-sufficient organisation. Operation and maintenance are to be financed through charges levied from the farmers and residents of the area. At the moment, EVE still receives subsidies from the Niedersächsiger government. In the near future, it is set to become entirely self-sufficient.

A farmer pays DM 53 / ha to EVE, and an owner of residential (built-up) land pays approximately DM 18 / address. Industrial estates/properties pay a certain charge in relation to the estimated value of the buildings. Niedersachsen pays a DM 6 / ha subsidy for the agricultural lands and forest areas. This subsidy has been reduced over time and is to be withdrawn completely in the near future.

Organisation

EVE is democratically governed by two bodies: (1) A general meeting or 'Verbandsausschuss' of 21 members (3 from each section), and (2) an executive board or 'Vorstand' of seven members, who are elected by and from the members of the general meeting. The members of the Vorstand again elect a chairman or 'Vorsteher'. Elections are held every seven years. They are announced in the local newspaper. Although perhaps in conflict with general democratic principles, there is an age-limit for the board members of 65 years.

The tasks of the general meeting involve approval of annual budgets and modifications of the by-laws of EVE. The Vorstand is more directly involved in daily operations, which they guide by meeting every 6 to

7 weeks. The Vorsteher or chairman is most involved. He sits in the office one or two days a week and signs outgoing letters and other documents. As such he is in charge of the daily operations of technical and administrative staff employed by EVE. Thus, contrary to the LKV Aurich, there is no appointed/employed director or 'Geschäftsführer'. The 'Vorsteher' only receives an allowance of EVE.

All landowners and leaseholders in the area are allowed to cast their vote for the members of the general meeting. The number of votes per person depends on the area of land leased or in ownership. This principle, as well as the interest of farmers in drainage, results in EVE being governed by farmers (all members of the general meeting and the executive board are farmers). Despite their limited voting power, it is possible for non-farmers to raise questions and issues during general meetings (3 to 4 times a year) and as such exercise some influence on the operation of EVE.

The office of the EVE is manned by a full-time staff who is responsible for the technical matters of the Entwasserungsverband. He is a fully employed staff. Next to him, the Entwasserungsverband has employed a man responsible for financial and administrative matters like budgeting and elections;

Drainage Operations

Open drains in the area are subdivided into 1st, 2nd, and 3rd order-drains. Maintenance of 3rd order drains is the responsibility of farmers. Maintenance of 2nd order drains is the responsibility of EVE. Maintenance of open drains basically involves the cleaning of the drains by removing weeds and sometimes through dredging.

All 2nd order drains in the area are documented in EVE's registers ('Lagerbuch', generally not updated as concerning the drain dimensions): Name, number, dimensions and geographical location. EVE has taken over some 150 kilometres of 3rd order-drains from the farmers.

All 3rd order-drains are indicated on detailed maps that coincide with cadastral records. The farmer's field adjacent to a 3rd order drain brings an automatic responsibility for the maintenance of that specific half of the open drain. Maintenance of 3d order drains along rural roads is generally the responsibility of the keeper of the road. Farmers receive a warning from EVE in case of insufficiently carried out cleaning. If no action is taken by the farmer after the warning has been issued, EVE will take up the cleaning and present the bill of expenses to the particular farmer.

Funding for Drainage

There seems to be a consensus in Germany that investment in water infrastructure has to increase in the future. It is estimated that an investment of DM 300,000 million would be reached by the year 2010. The main priorities are to bring the water quality standard in the former East Germany and their infrastructure up to the standard required by the law, to repair and improve sewage systems, and to build nutrient removal plants in all.

According to the federal ministries involved in water resource protection and management for the year 1993, a total sum of DM 9,880 million were invested. Of the amount about 66% was spent in sewage systems, 15% was spent on drinking water supply and 19% was spent through the common objective 'Improvement of Agricultural Structures and Coastal Protection'. This included investment in drainage works (Kraemer and Jager 1998: 221).

Expenditure involving the installation and maintenance of drainage networks within the command area of WLA and the operational expenditure is normally covered by the contributions to an association made by

its members and those non-members who benefit by its work. In fact, the financial basis of an association is its membership fee, which has to be paid as public charges. The level of fee depends on the amount of funds needed to fulfil the association's task and on the cost of services rendered by the association. Members are generally charged in proportion to the land operated by them. As mentioned in the preceding the one who operates the land is charged and not the one who owns (Brussel 1998:76, Wolffe and Konig 1997: 221).

In Germany, revenue for investments in water management is raised through two instrumentalities. The one is effluent charges and the other is water resource tax. The Federal Effluent Charges Act establishes a water pollution tax for emissions into recipient water bodies, which is independent and separate from (financial) sewerages charges for the provision of municipal sewerage services. The charged revenue must be used for measures to improve water quality and thus benefits directly or indirectly those liable to pay. The amount payable by each emitter is calculated on the basis of total load of a number if pollutants and classes of pollutants, which are converted into units of toxicity.

After earlier discussions at federal level in the 1950s and 1970s failed to bring about imposition of a federal tax, in late 1980s the water resource taxes relating mainly to surface and ground water abstraction was initiated at the *Länder* level. Apart from these two instrumentalities, there are other sources of raising revenue for funding water management. In *Tables 5.1, 5.2 and 5.3*, sources of financing, unit rates according to Effluent Act and water abstraction rates at Baden – Württemberg (the first *Länder* to adopt water abstraction Act) are presented. (Kraemer and Jager 1998: 222-224).

It is known that a lot of water pollution is caused on account of non-organic agriculture. In Germany only 37.5% of ground water is unaffected by pollution and 24.3% of it is affected by agriculture (20.5% on account of fertilizers in agriculture and 3.8% on account of use of pesticides). In case of surface water it is estimated that only 5% of water remains unpolluted and 95% of surface water gets polluted. To check the pollution of water from agriculture farmers are prohibited to use of more than prescribed doses of fertilizers. The prescribed limit in Germany is 50 mg nitrate (fertilizer) per litre of water. In lieu of these, farmers are paid money by the government who takes this money from the water works. This is the usual pattern and hence there is no direct interaction between the water works (companies) and the farmers. However, ten years ago an experiment was made in the Holsterhausen Holsterhausen / Ufter Mark area in North Rhine-Westphalia region (Lander) where a cooperative approach between farmers and one of the biggest water company (RWW) for the prevention of water pollution. During the last ten years the approach has been consolidated and institutionalised. The cooperation exists between RWW and 450 farmers (350 of them in Holsterhausen/Ufter Mark). The organisational structure devised for this cooperation consists of a Board having two chairmen – one farmer and one representative of the company (RWW). The Board advisory standing committee consists of 3 farmers, one representative of each of agricultural authority and agricultural association and two representatives of the water works (RWW). The standing advisory committee meets once or twice a year together with the consultants who visit every member of the cooperative at least once a year. The most important institution of the cooperative is the consultant (agronomist) – the expert acting as a mediator. The consultant is paid by the water works and employed by the agricultural authority. In addition to him/her there are 4 part-time consultants who are company employees. Apart from getting financial help from the water works (the company), for adhering to agriculture/horticulture related prescriptions suggested by the water works, the farmers and gardeners also get financial supports from the government to buy special machinery to control the ground water pollution. This cooperative venture between farmers and the water works is a unique and highly successful case in Germany (RWW, 1999).

Figure 5.1 Institutions and functions in water management

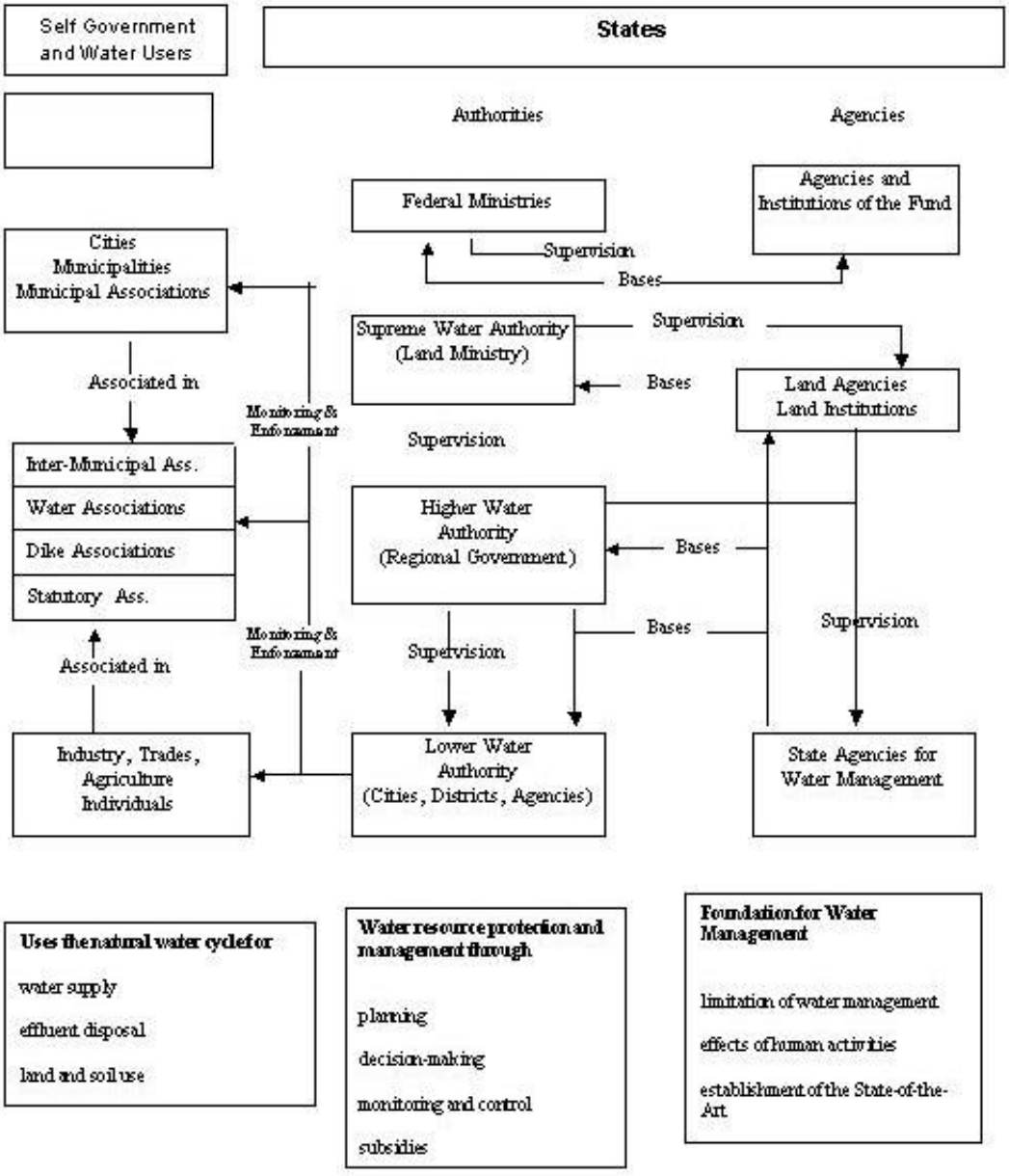
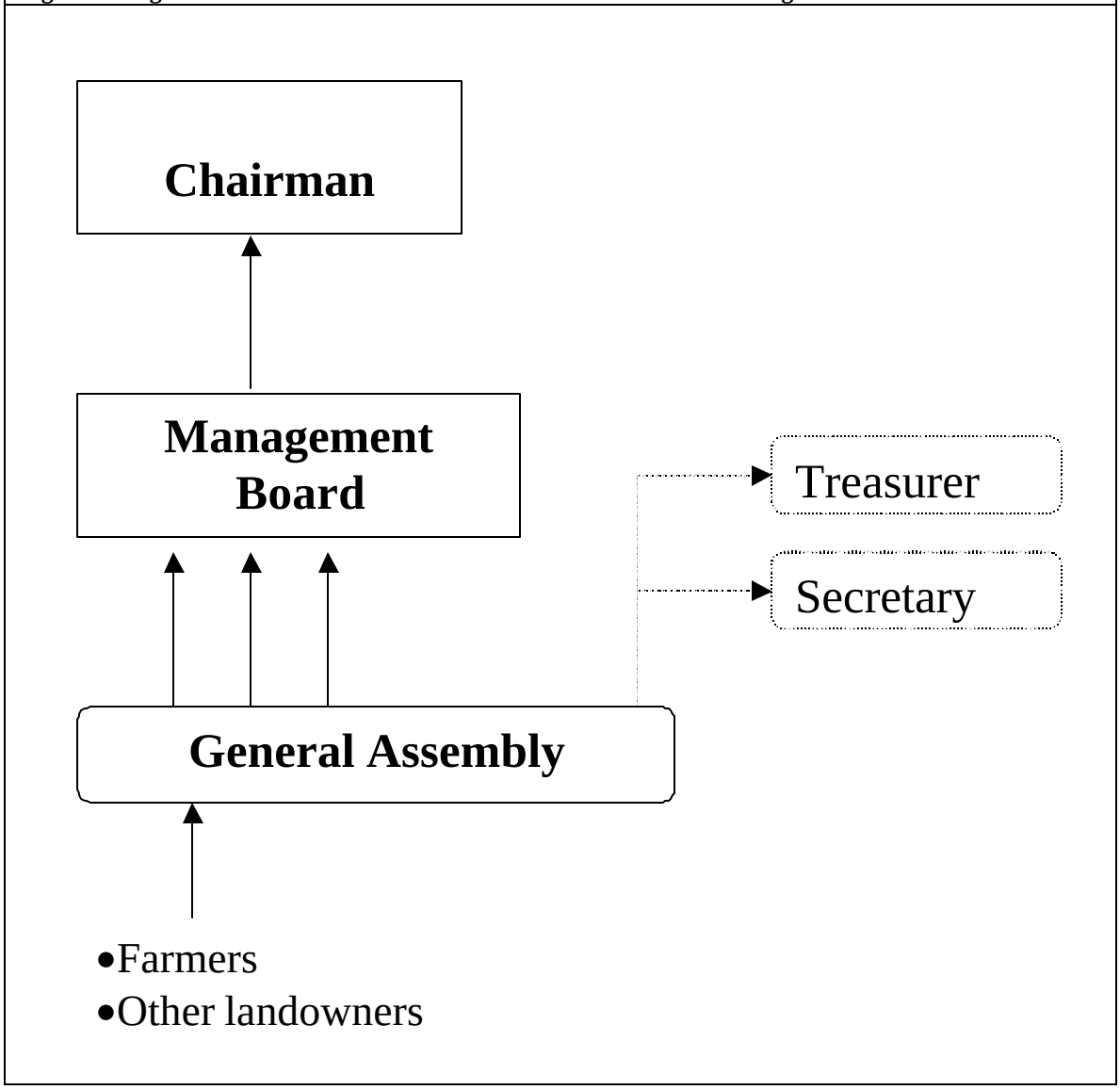
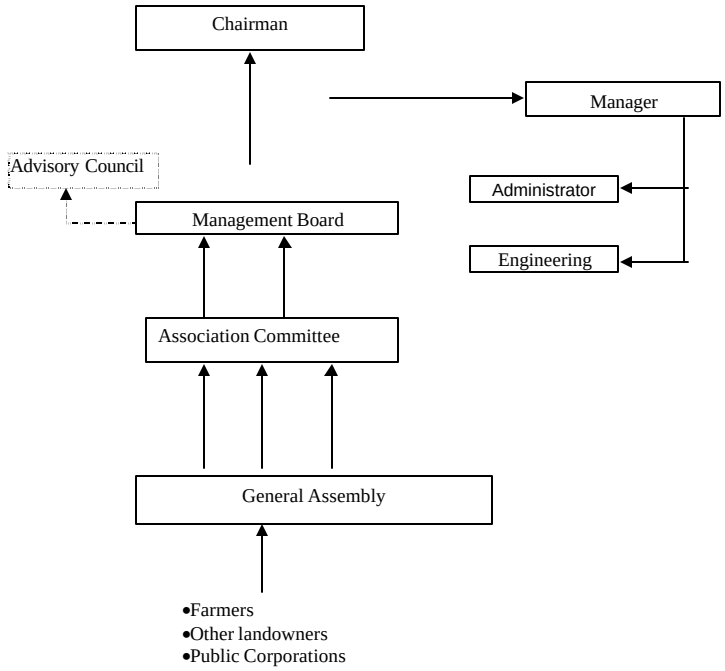


Fig. 5.2: Organisational Structure of a smaller Water and Land Management Association



Reproduced from Wolff P. 1997: 219

Figure 5.3 Organisational Structure of a Large Water and Land Management Association



Reproduced from Wolff P. 1997: 221

Impact of Drainage on Agriculture

The economics of Germany have undergone considerable change in the last decades. In connection with this change agriculture is loosing its leading role in economic development (Wolff *et al* 1996: 25). In fact, inherent characteristic of conventional agriculture in any economy is that it is a declining sector because its importance in the economic and political life of a nation inevitably diminishes through time. In Germany, agriculture is losing its dominant position in rural societies. This change is leading to a number of problems. The farmers are increasingly confronted with complaints, reports to the police, damage to property etc.

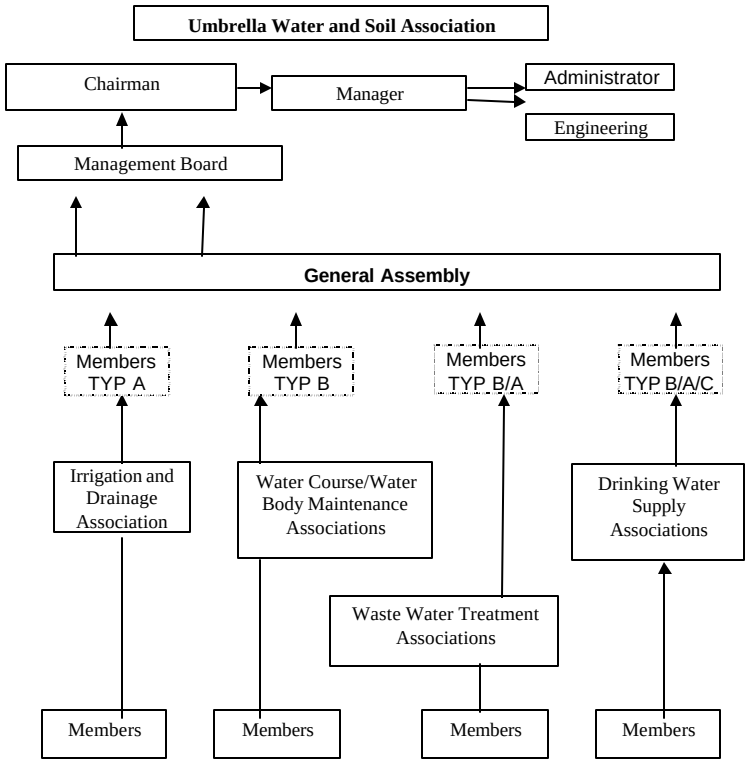
In West Germany the number of farms has decreased by half since 1950. In 1950 there were some 1.6 million farms employing fewer than 3.9 million family workers on a full-time basis. In 1992, there were only 0.58 million farms with less than 0.54 million full-time family employees. The main reason being many farmers left their land to work in industry and service sector. Others concentrated on part-time farming (Wolff and Konig, 1997: 231).

The declining role of agriculture is reflected in water use. In 1993 water use for agriculture was estimated at around 1 thousand million cubic metre. This is significantly lower than 2.3 thousand million cubic metre water that was being used for agriculture just four years prior to that in 1989. This reduction is especially noteworthy because the figures include water use in Western and Eastern Lander. This means even in Eastern Lander there was a significant decrease in agricultural activity after the unification in 1990 (Kraemer & Jaegar, 1998: 249).

Generally the farmers who stopped farming left their lands to the neighbouring farmers and did not sell it to them. The biggest problem resulting from such a situation is that the non-farming members are not willing to give their approval to larger investments necessary to improve the existing irrigation and drainage system. The IA Weiterstadt in the south of Frankfurt is facing such a problem. According to Wolff and Konig, only 6 farmers of 46 members of the IA are full-time farmers and 4 are part-time farmers (1997:231).

According to Brussel (1998:77) with the loss of prominence, agriculture oriented associations (especially the Polder Boards) are losing importance and members. The associations are losing members because with the new integrated guidelines the farmers cannot pay for all the costs or are in larger associations. On the other hand, the opportunities provided by the legislation have attracted many citizens to join up and form WLAs for a variety of purposes, such as preservation of forests, recreational areas and nature reserves.

Figure 5.4: Organisational Structure of an Umbrella Water and Land Management Association



Reproduced from Wolff P. 1997: 221

Integrated Water Management

The term 'integrated water management' has a vast range of meaning. In Germany it is referred to as integration of water protection requirements into other policy areas. This also means protection of the natural environment and ground water reserves. This includes the protection and development of watercourses and waterways, combining the safeguarding of quality and quantity management. In Germany water resource protection and management is carried out in the interest of natural ecosystems and for the benefit of water users. In such a scenario water policy is seen as part of environmental policy, which must serve as an instrument to integrate environmental protection requirements into decision-making in other fields.

This kind of policy integration has a legal basis in the revised Article 130R(2) of the EEC Treaty as amended by the Maastricht Treaty on European Union. The amended treaty states that environmental protection requirements must be integrated into the definition and implementation of other community policies. In essence, it means that water users use the resource sparingly and pollute as little as possible.

The emphasis on pollution control has gained importance as water 'shortages' or regional water stresses are generally caused by deterioration in water quality. The terms 'shortage' in quantitative sense does not apply in Germany as it is richly endowed with water with the exception of the Berlin and the Lausitz lignite mining area. As a result, the emphasis in Germany is on integrating water resource protection requirements with the various sectoral interests of water users. The highest priority is given to public water supply, and this priority is reflected in numerous regulations of the Federal Water Management Act.

The regulation of water resource protection is effected mainly through three types of instrumentalities. The first relates to licences and permits. The granting of permits and licences for obtaining water have been developed to ensure the integration of sectoral water requirements in global planning and management. The second refers to mechanism adopted for eliminating or restricting pollution. The third instrumentality involves encouraging creation of self-governing associations for the purpose of water management. At the heart of the principle of self-government are members' contributions, which allow the associations to fulfil all functions that are in their respective interest. The *Länder* governments need contribute only to the extent that the public interest is served by an association (Kraemer and Jaegar, 1998: 219-221).

Public Participation and Conflict Resolution

The German people are well informed about water related issues through newspapers, radios, TV programmes and more particularly at the federal and *Länder* level, numerous publications contribute to public awareness. In Germany, a number of instrumentalities exist for the participation of public in water management issues and resolution of conflicts arising thereof.

A number of procedures obtain in Germany for public participation in water management decisions. In parliaments including municipal parliaments or councils, there are formal hearings. These take place when legislative projects or decisions are debated but can also be held to allow for discussions beyond short-term policy discussions. As a matter of principle, the parties/individuals affected by a legislative initiative are informed and asked to give opinion.

There are many planning procedures where formal participation of the general public and interested parties comes naturally e.g. establishment of WLAs and EIA. The procedure usually involves an obligation to provide information, public hearings and consultations, as well as formal protests and reviews.

The citizenry is also involved in decision-making concerning technical rules and standards. The presentation of drafts is made public in specialised journals, and in case of rules and standards that are generally binding also in Federal Gazette. Anyone can protest over these and there are formal protest and decision-making procedures. In reality general public neither have the competence nor the interest to influence decisions. Generally in such cases general public is represented through specialised associations dealing with environment, natural conservation and consumer protection.

Apart from judiciary, arbitration and mediation procedures are instrumentalities through which conflicts are resolved. Such procedures have been mentioned above. In addition, joining water users with sometimes conflicting interests in associations, and in particular the statutory associations and in WLAs is, in reality a form of conflict avoidance and resolution because the associations help in establishing long-term co-operation.

The rules and regulations (statutes) of associations and many private contracts provide for arbitration or mediation procedures to resolve conflicts. There are following two main models:

Permanent arbitration and mediation panels, which can be called in by either side in case of conflicts.

Arbitration and mediation panels, which are constituted following a predetermined procedure in case of conflict. Such a procedure typically provides for each side naming one or two members of the panel, which then jointly selects a third or fifth member president. Typically, the president must be qualified to be a judge and has casting vote (Kraemer and Jaegar, 1998:268-270).

Subsidiarity

The structure of state and government in Germany has been shaped by the subsidiarity principle, more than in other Member States of the EU including those with highly federal structure (Emiliou 1992).

In Germany, subsidiarity is seen as determining the future structure of Europe and guiding the process of integration. It has constitutional status and was interpreted by the German Federal Constitutional Court, binding German authorities and institutions of the EU. Article 23(1) of the German Basic Law proclaims: "In order to achieve united Europe, the FDR participates in the EU, which … is bound by the subsidiarity principle…"

The German Federal Constitutional Court's decision of 12 October 1993 on the constitutionality of the Federal Republic's ratification of the Maastricht Treaty on EU, underlines the role of the subsidiarity principle as a legally enforceable limitation EU competence.

The German Federal government has developed procedures and tests at national level to assess systematically and consistently whether action by the EU complies with the subsidiarity principle and is commensurate in its scope. If EU action is found to violate the subsidiarity principle Germany is bound to reject. Such a proposal in the EC and in case it is adopted, to take legal action before the ECJ (Kraemer and Jaegar 1998: 403-404). Thus, in ruling of the German Constitutional Court, subsidiarity is interpreted as a legal rather than a socio-philosophical concept (Emiliou 1992).

The inclusion of the subsidiarity principle in Maastricht treaties in the year 1992 has strengthened the importance of decentralised administration and self-reliance in regional and local organisations (municipalities, river basin commission, associations etc.) It is recognised that in the environment and natural resources management sector local and regional institutions can be highly useful (Dirksen 1997:2).

Here due credit needs to be given to the revision brought about through 1991 Water and Soil Associations Act. The Act grants the associations a far-reaching right to self-administration. For example, freedom to draft by-laws is granted (article 6). The establishment of the association is also possible through a decision by its members and not only ex-officio (article 7). The form of competencies of the board of directors (article 52), the committee (articles 49 & 50) and the general body is made the most powerful organ vis-à-vis the previous version. The tasks and the competencies of the General Assembly have been spelled out in articles 47 and 48 of 1991 Act (Water Association Act 1991).

According to Wolff *et al* experience in Germany shows that an important solution to water related problems is to give users the responsibility for developing and managing the water resource. This requires that farmers become properly organised in WUAs, able to discharge their new responsibilities, and they have security of tenure to the land they farm and irrigate (Wolff *et al* 1996:25).

Summing Up

This chapter consists of three sections. The first highlights the main features of drainage institutions in the four countries studied which were responsible for the sustainability of such institutions over time. The second section covers some key institutional strengths in each of the four countries. The third section covers some of the key trends in general and also with particular reference to drainage institutions. These issues are private versus public institutions, complexities of funding, movement towards integrated water management, environmental critique, degree of democracy / subsidiarity and impact of drainage on agriculture, including the limitations of data in this respect.

Overview of Drainage Institutions

The origin of drainage institutions in the four West European countries can be traced back to the Middle Ages. The earliest forms appeared in the flood-prone area known today as the Netherlands. The organisational forms were initiated by the eleventh or twelfth centuries by farmers, monks and local communities. However, such farms were soon complemented with farmer drainage bodies and later with polder boards in reclaimed lakes. Similarly, developments took place in low-lying areas in neighbouring countries with the establishment of *Wateringues* (Polder / Drainage Boards in France), also around 1200 A.D., the first drainage board, Romney Marsh in England (1257) and the Deichverbände / Sielverbände (Dyke Boards / Drainage Boards) in Germany in the 13th century.

A common feature of these local bodies was that they were initiated out of a collective need of the local people. The founders of these bodies jointly accepted their responsibilities, formulated their own rules and regulations, apportioned tasks and contributions and set sanctions and penalties.

The rural-based farmer-driven local water management organisations more or less remained financially and democratically autonomous institutions until far into the twentieth century. This is inspite of all kinds of social, political and technological advancements.

Until the 1950s, local water management organisations can be characterised as follows (Brussel 1998: 70):

Practically, all bodies were initiated by the landlords / users (generally the larger and more influential ones) and set up and approved by a majority of participants.

The water management issues were decided either only or principally by farmers.

With the increase in the number of participants and specialised management requirements, committee system came into being. The committees were constituted by the general assembly on a one man – one vote or proportional land area basis.

All the farmers including tenants paid duties / levies and / or supported labour.

The drainage boards had the authority to issue by-laws and regulations including sanctions and penalties, either by the board itself or by a higher administrative agency.

A lot of changes have occurred, particularly since the mid-1980s mainly on account of increasing environmental concern, economic development and greater pressure on land. Now, the higher government has assumed greater responsibility safeguarding the public interest leading to the enactment of new laws in all the four countries studied. The impact on drainage bodies of these developments has been minor in England. However, in others where a larger number of interested parties require a vote, the boards have embraced multipurpose tasks, often leading to merger to form larger bodies such as in the Netherlands.

Institutional Strengths

In an analysis of institutions related to water resources in general and drainage in particular, the identification of institutional strengths is of paramount importance so that in cases of replicability, due care is taken in installing and nurturing such institutions in new countries. Therefore, this section summarises key institutional strengths in countries of the study, i.e., England, the Netherlands, France, and Germany.

England

The legislation governing water management is established centrally and regulation is achieved by national organisations. The EA, HMIP, OFWAT and DWI have harmonised approaches taken in the different regions. As a result, all activities in England and Wales are subject to the same rules and the same enforcement policy. The other positive aspects are as follows:

Establishment of private water companies under Margaret Thatcher's privatisation programme in 1989 has led to application of new technologies on account of injection of private capital by the companies and effective enforcement by regulators.

Separation of regulatory and operational practices has led to the provision of efficient and standard services by the private companies.

The regulatory activities of EA are secure as their costs are recovered from those subject to regulation.

Effective long-term catchment management planning on a regional (catchment) basis is possible because of excellent coordination at the national level mainly through EA. Catchment approach is further facilitated in England because unlike rest of Europe, EA can manage the rivers in a multifunctional approach from source to sea and does not have to depend on the consent of other countries.

The Netherlands

The Water Management Act, 1989 marks the most important development in integrating policy and legislation. The Water Management Act integrates several plans at different government levels and thus reduces the number of coordination mechanisms. The most relevant merits of the existing system aiming at integrated water management are at a strategic policy level. The other points of merit are as follows:

The evolution of the public administration system over the years has resulted in a decentralised, unitary state with a substantial delegation of operational powers to the lower authorities.

Within an unlinked institutional structure, the autonomy of each level of government is guaranteed by the constitution. Precise relations in a particular field of government are defined in the legislation. Generally, the higher authorities have a supervisory power over the lower one which ensures national integration.

However, supervisory powers are devised in such a way that lower authorities can pursue their own policies provided they do not come into conflict with the policies of higher authorities.

Water planning in the Netherlands is largely based on the consensus approach. In fact, this approach is a product of the tradition of building coalitions at the political level. So much so that the tendency towards consensus actually clarifies why the instrument of planning has gained such an important role in Dutch water policy and management and why preference is given to general framework law instead of detailed legislation (Perdok 1995: 2-3).

Sustainability of Dutch Water Boards is another institutional merit of Water Management in the Netherlands because of the shift in Dutch Water Management from an agricultural orientation to an environment – friendly posture. In recent years, integration of water management functions has been obtained by merger of smaller water boards into larger ones mainly because small water boards were largely dominated by agricultural interest. With the merger of smaller water boards into larger ones, their expertise has grown and representation of farmers has been reduced.

France

The most favourable institutional development in France is the establishment of six basin level agencies. The general economic incentives-based management of the agencies has demonstrated its efficiency for resource management as well as for pollution control. The agencies were initially mistrusted and regarded as technocratic institutions but soon they gained the image of decentralised institutions close to water users. Agencies operate on 'polluter-pays' principle. The other positive aspects of the institutional framework are as follows:

In France, a joint management system of water services between the private and public institutions operates quite successfully. It offers water services the advantages linked to the involvement of the private sector, but with maintained legitimacy of local authorities on this kind of arrangement. What is remarkable is the fluidity of relationships that have developed between the communes which retain authority and private companies which have the know-how.

French water management has undergone considerable change and improvement since the 1960s. During the last forty years, France has developed an interesting and adapted water management system. It is now increasingly turning towards comprehensive approaches which were difficult to develop in the traditional administrative set up. Consequently, a good balance of power is found between the prefects[18], the local councils and the six agencies. This provides water engineers in public and in private sector as well as environmental experts and planners with increased opportunities to develop their skills. (Correia 1998: 77-78)

Germany

The most remarkable institutional strengths of water management in Germany consist of the following:

The separation of state administration for water management from the operation of water installations and quality of water administration in Germany. While the former is concerned with the global responsibility of water resources protection and management, the latter is concerned with specific functions of relevance to water management carried out by private or municipal operators.

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[18] The government official who holds the administrative authority at regional and departmental level .

The implementation of environmental policy is carried out through direct regulation by prescriptions, prohibitions and limit values. At the same time, it has been combined with economic instruments, both for setting incentives and providing revenue.

The functional self-government in water management associations have proved to be effective for water management functions such as flood control, irrigation and drainage. Members' contributions as well as voting rights are based upon an assessment of respective benefits leading to equitable share in paying contributions.

The institutional mechanism provides for a high degree of independence for the operators of municipal services which are often established in the form of joint stock companies. The advantages of municipal enterprises lie in combining management according to economic criteria with democratic control over strategic policy issues (Correia *et al* 1998: 69-70).

Key Trends

Blurring of the Private versus Public Dichotomy

The distinction between private and public is losing relevance in the light of recent developments. In fact, what is being witnessed is a reversal of role of private and public institutions. Consequently, public organizations are entering in greater numbers into the domains which used to be considered the exclusive preserves of private organizations. On the other hand, private organizations are coming under closer scrutiny of regulating authorities leading to curtailment of their freedom to a great extent. In England, Kings Lynn Consortium was found to be promoting new colonies in its area of jurisdiction with an aim to maximise its income. Similarly, Delfland and other water boards in the Netherlands were enhancing their activities and were taking up sewer management and sewer treatment as their new activities. In France, the six basin-level agencies have more autonomy to raise and distribute fiscal benefits than many private enterprises. As against this kind of freedom and autonomy enjoyed by public authorities, private organizations such as drinking water companies in England, in the Netherlands, Germany and France are facing more and more regulatory controls exercised by governments and government agencies to maintain high standards of drinking water and pollution control.

Diverse and Complex Funding

The conventional sources of funding in all the four countries have been contributions from the ratepayers and grants from the government – the federal as well as the state / province / county. The extent of grants vary between countries like France where doses of subsidies are quite high to the Netherlands where grants are least. In England and Germany, moderate grants are available.

One noticeable feature in the shift in the sources of income of local authorities. Earlier, the local authorities were getting their (main) income from agricultural farmers. But, in the present times, these bodies have interests in other areas and, as a result, these bodies have incomes from diverse sources. For instance, in 1999, 61% of the total income of IDBs in England was coming from city councils, 39% from agriculture, while ten years earlier, in 1989, 53% of income was coming from agriculture and 47% from city councils. Likewise, in the Netherlands, 53% of the total income of water boards in 1980 was coming from agricultural areas and 47% from built-up areas. But, in 1991, it was found that 45% of the income was coming from agricultural areas and 55% of income was coming from built-up areas. The local drainage authorities in recent times are looking at newer areas of income. For instance, Kings Lynn Consortium is raising more money from the developers of the new colonies than from the rate payers and

giving relief to that extent to the farmers. In Kings Lynn Consortium, farmers, particularly smaller ones, are getting a lot of relief because it raises its income from sources other than farming.

Apart from shifts in the sources of income in case of local public authorities, the blurring of private and public distinction is also highlighted in the fact that not only private drinking water companies meet the regulatory requirements but also raise the necessary funds to make improvements in water quality to the satisfaction of regulatory bodies. In fact, the most visible trend is that private are investing in advanced technologies raising loans from public. These companies are resorting to public borrowing because such companies have established their credibility among the people.

Integration of Water Management

This integration is taking place at various levels. At one level, it relates to adoption of uniform standards, principles and norms by the various countries which constitute the European Union. Among the four countries studied, Germany is foremost in adopting EU policies and programmes. At another level, an integration is sought by creation of catchment-based regional organisations to harmonise the policy and to lay uniform standards. At the third level, it relates to integration of existing water resources through various legislative and regulative measures.

The integration took different shapes in the four countries studied. In England, it took the form of regionaliation. On one hand, it led to concentration of regulatory and management functions into the hands of fewer and fewer increasingly centralised bodies and, on the other, to highlight the importance of large river basins rather than individual sections of rivers as basic units of water management. In respect of the Netherlands, integrated water resource development and management is a task for public authorities and not for private bodies and this is a conscious political decision. In France, like in England, initial moves towards a more holistic and sustainable water policy took the form of regionalisation. The French created a new and supplementary regional tier with regard to water management. The establishment in 1970 of six basin-level agencies has been acclaimed as an innovative and unique initiative within Europe. Integrated water management in Germany is referred to as integration of water protection requirements into other policy areas. This also means protection of natural environment and ground water reserves. Water resource protection and management, in Germany, is carried out in the interest of natural ecosystems and for the benefit of water users.

Environmental Concerns

The issues concerning environment, particularly those relating to water date back to 1973 when the environmental action programme was presented at the EU level. At that time, directives on the quality of drinking and bathing water were motivated by public health considerations mainly, but ecological considerations played a major role as well (Betlem: 147)

The increasing importance of environmental issues led to a shift in paradigm. Therefore, since 1980s, the maxim that rivers and watersheds should be managed solely to maximise consumptive use is slowly giving way to a belief that natural resources should also be managed for the sake of environmental values such as biodiversity and social and cultural values. Keeping this in mind, increasing attention is being paid to the prospects of agricultural optimisation and reduction of environmental impact, in order to develop feasible alternatives that deal more specifically with agro-hydrological demands and fertilising. This is supported by the development of hydrological systems analyses and eco-hydrological approaches.

Environmental concerns in the four countries played an important role in triggering institutional transformation. Each country initiated its own process of institutional reforms. For instance, in England,

an all-powerful Environmental Agency was created while France established six basin-level organizations. Side by side, environmental legislation is becoming stricter. For example, the maximum amount of fertilizer used and the period during which it can be applied is legally defined. Such measures are implemented so that physiochemical norms of the external environment are not violated.

In all of the four countries, there is a tendency towards increased integration of water and environmental policies. This tendency is primarily influenced by sustainable development as a leading concept. All this is leading to protection of natural areas, establishment of recreation centres, including birds and animal sanctuaries and green areas. A direct consequence of this is that a lot of land is going out of the area under drainage. This means a shift in activities from drainage to ecosystem management which means that local drainage association have to look for new beneficiaries who will pay for the activities which constitute ecosystem management.

Diminishing Role of Agriculture

In all of the four countries studied, the importance of agriculture has gone down considerably. This is reflected in the fact that no major reclamation of land through drainage has been done in any of the four countries except in the Netherlands.

In England, the need for reclamation of land through drainage was realised in the first quarter of this century. It was initiated sometime in the early 1930s and continued up to 1974 but no more reclamation was implemented after that. In the low-lying areas of Western Europe, drainage acquired maximum urgency after the World War II when food shortage was a common feature. During this period, a lot of progress in drainage works was made leading to substantial increase in food production in all four countries. In fact, land drainage has played an important role in modernisation of European agriculture and in the achievement of self-sufficiency for food. Improved drainage was needed in about 25% of the agricultural land out of which, about 70% have been sub-surface drained, mainly during the last 30 years. (Zimmer 2000 Vol. I: 121)

An inherent characteristic of conventional agriculture in the economy of all of the four countries is that it is a declining sector. This is not surprising because its importance in the economic and political life of a nation inevitably diminishes with the growth of the economy over time. In all four countries, agriculture is losing its dominant position in rural societies. As a result, in these countries, farmers are confronted with an increasingly critical society and are being regarded as polluters of the environment and enemies of a lively eco-system. Wetland conversion into cropland is a focal point of major public concern: in wetlands, the degradation of the eco-system and of the landscape is easily perceptible. The concern regarding wetlands has progressively been extended to every waterlogged cropland and has skewed the debate in many places (Skagg 1992 and Zimmer *et al* 1995). In Germany, farmers are increasingly confronted with complaints, reports to the police, damage to the property etc.

A consequence of diminishing importance of agriculture has been that it has led to a reduced role of drainage in low-lying areas of Western Europe. This means that either the local drainage institutions have to mould themselves to meet the emerging demands or to wither away. In England and the Netherlands, ware boards are adjusting themselves to come to terms with new demands and have diversified the sphere of their activities, while, in France, *wateringues* and WLAs, which have hardly take account of the changed scenario, are facing imminent collapse.

Role of The European Union

The overarching role of EU is visible in several water management policies, decisions and concerns in all the four countries. Efforts are being made to integrate the various countries by advocating / enunciating / setting common standards and common institutions. A small example will clarify this point. At the EU level, it has been decided that the drainage institutions should be catchment-based. Since Denmark has administrative-based local drainage organisations, it has to establish new catchment-based drainage organizations. Keeping in mind that a lot of legislation concerning water management emanates from the European parliament, the Executive Director of Association of Drainage Authorities (A.D.A.) in U.K. has taken lead and established the European Union of water management (EUWMA). This association has been established with a view to facilitate, through formal arrangements or more informal direct consultation, interaction among members drawn from all the four countries.

Although the influence of EU is noticeable in all areas, the two areas where its influence is most noteworthy are environmental and subsidiarity issues. With regard to the environment, the EEC treaty as amended by the Maastricht treaty of European Union states that environmental protection requirements must be integrated into the definition and implementation of other community policies. This, in essence, means that water users use the resource sparingly and pollute as little as possible. An important development since the inception of EU is that water policies are moving away from a sectoral approach to water and environment management at EU level. It is reinforced by adoption of uniform principles, standards and policies in all the four countries.

Subsidiarity, as a general EU principle of environmental policy, was adopted since the beginning of EU in 1973, but it was legally established in the Maastricht treaty in February 1992. The treaty marks a new stage in the process of creating an ever-closing union among the people of Europe wherein decisions are taken by as close a participation of the citizenry as possible. In its broader sense, the subsidiarity principle is also meant to obtain a protected freedom of action for local and regional authorities. The subsidiarity principle is most vigourously followed in Germany, where the structure of state and government has been shaped by this principle, more than any other member-state of the EU including those with highly federal structures.

Appendix 1 List of Water Boards in Terms of Their Area of Operation and Water Management Tasks

Waterboard[19]	*Area (ha)*	*Water quantity*	*Water quality*	*Water quality and quantity*
Province of Groningen				
Dollardzijlvest	92,000	X		
Eemszijlvest	56,750	X		
Noorderzijlvest	130,000	X		
Province of Friesland				
Blija Buitendijks	100	X		
Boarn en Klif	61,000	X		
Wetterskip Fryslân[20]	574,224			X
Lauwerswâlden	58,000	X		
Marne-Middelsee	71,000	X		
Sevenwolden	74.500	X		
De Waadkant	51,200	X		
Province of Drenthe				
Zuiveringsschap Drenthe	715,000		X	
Hunze en Aa	72,000	X		
Meppelerdiep	87,600	X		
‘t Suydevelt	50,000	X		

[19] Source for the information in this table: “Waterschapesalmanak 1999/2000”, 1999, Unie van Waterschappen, Den Haag.

[20] The area of this waterboard entirely coincides with the Provincial boundaries, and covers the entire or part of the area of the other waterboards in the Province.

Waterboard[19]	*Area (ha)*	*Water quantity*	*Water quality*	*Water quality and quantity*
Province of Overijssel				
Groot Salland[21]	122,500			X
Regge en Dinkel	134,300			X
De Vechtlanden	35,500	X		
Wold en Wieden	51,500	X		
Province of Flevoland				
Heemraadschap Fleverwaard	97,500			X
Noordoostpolder	50,000	X		
Province of Gelderland				
Polderdistrict Betuwe	43,000	X		
Polderdistrict Groot Maas en Waal	55,000	X		
Waterschap van de Linge	74,200	X		
Rijn en IJssel	200,000			X
Zuiveringsschap Rivierenland[22]	135,000		X	
Polderdistrict Tieler- en Culemborgerwaarden	31,158	X		
Vallei en Eem	106,000			X
Veluwe	140,000			X
Province of Utrecht				
Hoogheemraadschap De Stichtse Rijnlanden	82,000			X

[21] Apart from water quantity management in its own jurisdiction, 'Waterschap Groot Salland' is furthermore responsible for water quality management in its own area as well as in the areas of 'Waterboard Noordoostpolder', 'Waterboard De Vechtlanden', and the part of the Province of Overijssel that is covered by 'Waterschap Wold en Wieden'. Note that 'Noordoostpolder' is a part of the Province of Flevoland.

[22] The area of this waterboard partly coincides with the Provincial boundaries and lies entirely within Gelderland. It covers the entire area of the waterboards 'Tieler en Culemborgerwaarden', 'Groot Maas en Waal', and 'Betuwe'.

Waterboard[19]	*Area (ha)*	*Water quantity*	*Water quality*	*Water quality and quantity*
Province of Noord-Holland				
Hoogheemraadschap Amstel, Gooi en Vecht	70,000			X
Groot-Geestmerambacht	21,000	X		
Groot-Haarlemmermeer	24,080	X		
Hollands Kroon	63,500	X		
Het Lange Rond	40,000	X		
Hoogheemraadschap van Uitwaterende Sluizen in Hollands Noorderkwartier[23]	180,000		X	
De Waterlanden	35,000	X		
Westfriesland	34,587	X		
Province of Zuid-Holland				
Hoogheemraadschap van de Alblasserwaard en de Vijfheerenlanden	38,260	X		
De Brielse Dijkring	20,850	X		
Hoogheemraadschap van Delfland	41,314			X
Goeree-Overflakkee	22,500	X		
De Groote Waard	28,500	X		
Zuiveringsschap Hollandse Eilanden en Waarden[24]	150,000		X	
Ijsselmonde	13,000	X		
Hoogheemraadschap van de Krimpenerwaard	13,579	X		

[23] The area of this waterboard partly coincides with the Provincial boundaries and lies entirely within Noord-Holland. It covers the entire area of the waterboards 'Hollands Kroon', Groot-Geestmerambacht', 'Westfriesland', 'Het lange Rond', and 'De Waterlanden'.

[24] The area of this waterboard partly coincides with the Provincial boundaries and lies entirely within Zuid-Holland. It covers the entire area of the waterboards 'De Brielse Dijkring', 'Goeree-Overflakkee', 'De Groote Waard', 'IJsselmonde', 'Krimpenerwaard', and 'Alblasserwaard en Vijfheerenlanden'.

Waterboard[19]	*Area (ha)*	*Water quantity*	*Water quality*	*Water quality and quantity*
De Oude Rijnstromen	26,350	X		
Hoogheemraadschap van Rijnland[25]	117,500			X
Hoogheemraadschap van Schieland	20,500			X
Wilck en Wiericke	23,300	X		
Province of Zeeland				
Zeeuwse Eilanden	97,000			X
Zeeuws Vlaanderen	73,150			X
Province of Noord-Brabant				
De Aa	83,800			X
Alm en Biesbosch	25,900			X
De Dommel	153,500			X
De Dongestroom	35,000	X		
Land van Nassau	33,000	X		
De Maaskant	79,000			X
Mark en Weerijs	52,000	X		
Het Scheldekwartier	51,500	X		
Hoogheemraadschap van West-Brabant[26]	163,000			X
Province of Limburg				
Zuiveringsschap Limburg[27]	220,876		X	
Peel en Maasvallei	127,000	X		

[25] The area of this waterboard does not coincide with the Provincial boundaries, i.e. it covers areas of both the Provinces of Noord- and Zuid-Holland. This waterboard covers the entire area of the waterboards 'Groot-Haarlemmermeer' (Noord-Holland), 'De Oude Rijnstromen', and 'Wilck and Wiericke' (both Zuid-Holland).

[26] The area of this waterboard partly coincides with the Provincial boundaries and lies entirely within Noord-Brabant. It covers the entire area of the waterboards 'Het Scheldekwartier', 'Mark en Weerijs', 'De Dongestroom', and 'Land van Nassau'.

[27] The area of this waterboard entirely coincides with the Provincial boundaries, and covers the entire area of both other waterboards in Limburg.

Waterboard[19]	***Area (ha)***	***Water quantity***	***Water quality***	***Water quality and quantity***
Roer en Overmaas	92,000	X		

Appendix 2 Main Geographical and Hydrological Characteristics of the Selected Countries

Parameter	*France*	*Germany*	*Netherlands*	*UK*
Size (km^2)	547,600	356,733	41,574	244,000
Population (millions)	56.8	80.3	15.1	57.0
Population density (\km^2)	104	225	357	234
Rainfall (mm/yr)				
Range	370-1230	500-2500	620-930	600-4000
Mean	800	768	775	900
Precipitation (mm)				
Average	800	768	775	900
Maximum	1400	2500	930	4000
Minimum	630	500	620	600
Main water use				
Public %	39	33	44	77
Agriculture %	31	12	22	6
Industry %	30	55	34	17
Reliance on surface water for public supply (%)	43	30	<33	80
Public served by public supply (%)	>98	97.9	99.9	>99
Public connected to sewer (%)	65	91	96	96
Public connected to treatment works (%)	50	89	88	85
Public connected to secondary treatment (%)	45	80	78	75

Source: Reproduced from Correia et al Vol. II 1998: 89

Appendix 3 Responsibilities For Water Management In The Selected Countries

Responsibility	*France*	*Germany*	*The Netherlands*	*United Kindgom*		
				England & Wales	*Scotland*	*Northern Ireland*
Surface water assessment and monitoring	Regional and Departmental State Office	State Water Authority / Regional and Local State Authorities	Regional Offices of MTPW	NRA	RPAs	DoE
Ground water assessment and monitoring	Regional and Departmental State Office	State Water Authority / Regional and Local State Authorities	Provinces	NRA	RPAs	DoE
Surface water protection and control[1]	Agence de l'Eau/Police de l'Eau	State Water Authority / Regional and Local State Authorities	State Water Office	NRA	RPAs	DoE
Ground water protection and control	Agence de l'Eau/Perfect	State Water Authority / Regional and Local State Authorities	Provinces[2]	NRA	RPAs	DoE
River and lake regulation	MoE/Landowner	State Water Authority	MTPW / Province	NRA	RPAs	DoE
Water supply	Municipalities[3]	Municipalities[3]	Municipalities[3]	Private water companies	RICs	DoE
Sanitation	Municipalities	Municipalities	Municipalities / Water Boards	Private water companies	RICs	DoE
Licensing discharge	Perfect[4]	Regional and Local State Authorities	Regional MTPW / Municipalities / Provinces / Water Boards	NRA and HMIP[5]	RPAs and HMIPI[6]	DoE
Licensing abstraction Surface water	Perfect[4]	Regional and Local State Authorities	Regional MTPW / Water Board	NRA	RPAs / SO	DoE
Licensing abstraction Ground water	Perfect[4]	Regional and Local State Authorities	Province	NRA	RPAs / SO	DoE
Implementation and enforcement	Perfect through the Police de l' Eau	Regional and Local State Authorities	Regional MTPW Provinces / Water Boards	NRA,HMIP DoE, DWI	RPAs, HMIPI	DoE
Pricing of water services	Municipal Mayor	Municipalities	Municipalities (water companies)	OFWAT	RICs	DoE

[1] Including use for recreation and conservation; [2] Provinces also responsible for non-state waters; [3] The operation of these services is often contracted out to private companies, or intermunicipal organizations; [4] Perfect is advised by technical services, the Agence de l'Eau and other NGOs; [5] HMIP for the most polluting processes under IPC; [6] HMIPI in conjunction with RPAs for the most polluting processes under IPC. Adapted from Correia et al Vol. II 1998: 14-15 Note: NRA is replaced by EA

Appendix 4 Water Management Planning In The Selected Countries

Country	*Plan*	*Statutory*	*Responsible authority*	*Time period*	*Status to date (1994)*
France	SDAGE (catchment) SAGE (sub-basin)	Yes	Comite de Bassin Local Water Commission	15 Years with 5-year review	Four plans completed
Germany	Water management plans (catchment)	No	Regional Water Authorities	Long term objectives	Very few completed
Netherlands	National & Provincial (not catchment)	Yes	Rijkswaterstaat	4 years	Second series now in operation
England and Wales	Catchment	No	NRA regions	10 years	164 by 1998

1 These plans are overseen by a National Council and catchment based Regional Water Councils.

Adapted from Corriea *et al* Vol. II 1998: 21

Note: NRA is replaced by EA.

Appendix 5 Pollution and principles and levels of fines available for pollution control offences

Pollution Principle	*France*	*Germany*	*Netherlands*	*England and Wales*
UESs	Minimum standards	Minimum standards	Minimum standards	For IPC processes
EQSs	Long term objectives / reference values			Minimum standards
IPC	Yes for the most polluting industries	No but EIA required for new plants	No	Yes for the most polluting processes
Self-monitoring	Yes for the larger, most polluting industries	Yes	Yes	Yes for the most polluting processes
Fines (£)	Administrative fines[1] Higher in court	Administrative fines up to 45,000 Additional in court	Coercion sum - after an established period, polluters are fined per offence per day. The level reflects the degree and nature of the pollution and the economic benefit gained. In court - For companies 400,000 or sometimes higher[2]	No administrative fines In court up to 20,000 on summary conviction. Unlimited on conviction by jury
Imprisonment	Yes	Yes	Up to 6 years	Up to 2 years
Remediation costs	Yes under criminal law	Yes under criminal law	Yes under criminal law to restore to original condition, repair damage and implement required improvements	Yes under criminal law to pay the costs for the NRA to clean up and restore the water (also under civil law)

[1]The Perfect may require discharges to deposit a 'consignation' equal to the costs of installing equipment so that the discharge consent is met which required when the work is completed. [2] Both may be imposed. If the assets obtained exceed a quarter of the maximum penalty, a higher category penalty may be used. In the case of legal persons still higher penalties may be imposed.

Appendix 6 Basis For Effluent Discharge Charges

System	*France*	*Germany*[1]	*Netherlands*[1]	*England and Wales*
Cost recovery	Yes - 5-10% of income	Yes - partly	Yes	Yes - 100%
Incentive charging	Partly but charges are lower than the Netherlands	Yes - up to 75% reduction when BAT applied Reduction already available during construction period	Yes - high charges	Partly but low charges
Revenue raising	Yes - income returned as subsidies	Partly - some income used for research grants	Yes - income returned as subsidies	No
Factors used to set charge	Load, sensitivity of receiving water, regional coefficients	Load (as pollution units)	Load, local coefficient, state or non-state waters	Load , sensitivity of the receiving water

[1]The German and Dutch schemes do not take into account the sensitivity of the water.

Reproduced from Corriea *et al* Vol. II 1998: 24-25

Appendix 7 Average prices for water and wastewater services

Country	*Water services (pence/m^3)*	*Wastewater services (pence/m^3)*
France	71.7	77.9
Germany	109.9	170
Netherlands	72.4	Based on size of household
England and Wales	58.7	Based on rateable value

Appendix 8 Financial Characteristics Of The Different Management Systems

System	*Country*	*Subsidy*	*Source of capital*	*Depreciation*	*Profit*	*VAT*	*Tariff basis*
Municipal	F, NL	Sometimes	Public	Not always	No	F, NL	Costs
Municipal franchise	France	Rarely	Public and private	Always	Yes	France	Costs + profit
Municipal company	F, NL, G	Sometimes	Public	Always	No	F, NL, G (water)	Costs
Mixed company	NL, G	Rarely	Private or public and private	Always	Yes	NL, G (water)	Costs + profit
Private company	E & W	Never	Private	Always	Yes	NL	Cost + return on capital

Reproduced from Correia *et al* Vol. II: 32

Appendix 9 Section 7 of the Wateringues du Pas-de Calais

Electoral list

Articles 13 and 14 of the Royal Ordinance of January 27, 1837, modified on September 12, 1969.

Maximum rate of tax per hectare : 1T = 145.00 F

4T = 580.00 F

Number of votes allowed for each elector :

Taxed at least	580.00 F and at maximum	1450.00 F = 1 vote	
Taxed more than	1450.00 and at least	2900.00 F = 2 votes	
Taxed more than	2900.00 F and at least	4350.00 F = 3 votes	
Taxed more than	4350.00 F and at least	5800.00 F = 4 votes	
Taxed more than	5800.00 F and at least	7250.00 F = 5 votes	
Taxed more than	7250.00 F and at least	8700.00 F = 6 votes	
Taxed more than	8700.00 F and at least	10150.00 F = 7 votes	
Taxed more than	10150.00 F and at least	11600.00 F = 8 votes	
Taxed more than	11600.00 F and at least	13050.00 F = 9 votes	
Taxed more than	13050.00 F		=10 votes

Drafted by the Administrative Commission of the 7th Section of Wateringues du Pas-de-Calais

Saint-Omer July 17, 2000

Provisionally ratified by the under prefect of Saint-Omer

Saint-Omer

7e SECTION WATERINGUES

DU PAS DE CALAIS

P.O. Box 361

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