INSTITUTIONAL WATER ISSUES IN EUROPE

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Abstract

Water is an essential requisite for development and an essential element of all ecosystems. It is also the subject of a complex and diversified industry. As a result of its nature and importance in virtually all areas of economic activity, water is the object of sensitive policies with impacts across many areas of social life, especially in water-stressed areas. The path to sustainable development cannot, and will not, exclude new water policies. Therefore, an analysis of sustainable water resources management needs to pay attention to the formulation of water policies and to the institutions involved in policy formulation and in its implementation.

Water resources management in the 21st century, in Europe and elsewhere, requires not only solutions to engineering problems typical of a traditional approach, but also a better understanding of the contextual processes involved in policy formulation and an appraisal of those processes. In simple terms, it matters not only how questions are answered, in a simple technical approach, but which questions are asked, which requires a better understanding of society and its formal and informal decision processes. Institutions are obviously a key element in the decision process.

The formulation of water policies is a complex and dynamic process, to a large extent driven by forces that are deep-rooted and often poorly understood. A complete analysis of these highly dynamic policy formulation processes and related institutions is very complex and changes significantly from one society to another.

To a large extent, and taking a broad view, it can be stated that water resources management institutions reflect society, its actors with their respective goals, its fractures and its balances of power. Thus it is no surprise that water institutions are so diverse in Europe although they emerge from deep-rooted trends in history, culture and politics. The result is that the existing diversity can be interpreted in terms of the social movements and historical evolution of each society, with each case being unique but part of a larger process of interlinked influences across borders, like any other area of social organisation.

The new European Union "Directive Establishing a Framework for Community Action in the Field of Water Policy" is a very interesting and stimulating legal document because it sets out to implement a common policy and harmonised action to achieve ambitious goals in the context of immense diversity.

The purpose of this paper is to briefly present the main features of the Water Framework Directive, together with the three main and inter-related sources of diversity in European water resources management: the differences between Member States with respect to water availability and needs, the differences in the contextual factors of decision-making processes, and the differences in the basic legal and cultural roots of water ownership and water rights.

Europe will be a lively and interesting laboratory for experimenting with water policies in the next two or three decades. The motto will probably be to apply different solutions to common problems and to implement similar solutions to very different realities.

1. Introduction

On 30th June 2000, on the last day of the Portuguese Presidency of the European Union, the European Council of Ministers approved the final text agreed with the European Parliament of the Framework Directive on Water Policy (official title: Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for Community action in the field of water policy).

This was one of those occasions in which it was clear to all who had followed the preparatory process that the end of one long journey was simply giving way to the beginning of another. It was back in October 1995 that the process had officially started, with a request by the Council to the Commission to draw up a policy paper on water, to be followed by the preparation of a new Directive. But it was further back, in 1988, 12 years before the final approval, that an informal meeting of Ministers responsible for water policies recognised the limitations of the directives hitherto approved and decided to take new initiatives aiming at a more integrated approach to water resources management, particularly by dealing with previously overlooked pollution sources, taking steps to integrate surface and groundwater problems and starting pioneering efforts in preparing a directive on the ecological quality of water.

The very concept of *ecological quality* was innovative and corresponded to a paradigm shift for two reasons. Firstly, water policy would concentrate for the first time on the water environment for its own sake, not on water as the raw material for any specific activity. Secondly, such a concept would necessarily require that significant differences among water environments throughout Europe should be duly acknowledged. In fact, ecological quality would refer to very different environments and different species in different regions of Europe rather than to physical or chemical parameters as it had generally been done previously.

Soon, a third dimension of innovation would be added, the institutional dimension, as it became increasingly clear that the improvement of water resources management practices could not avoid dealing with issues of water governance.

In this paper, a summary review of the main achievements and obligations of the new Water Framework Directive (WFD) is presented in section 2. The differences with respect to water availability, needs and uses in Europe are summarised in section 3. A broader view of the institutional issues based on the contextual analysis of water policies is presented in section 4. In section 5, the most fundamental issue of water governance, namely the problem of water ownership and rights, is briefly discussed. In section 6, a brief review of the institutional problems relevant to the European scene is given. Finally, in section 7, some concluding remarks are presented.

This paper is mainly based on the results of two research projects funded by the European Commission, EUROWATER and WATER 21, conducted by a group of European universities and research institutions (IST from Portugal, LATTS/ENPC from France, Ecologic from Germany, RBA/TU Delft from the Netherlands and WRC from the United Kingdom). EUROWATER consisted of a comparative study of water resources management institutions in the European Union. The results of this project are documented in two volumes that contain substantial information on water issues and dilemmas in Europe (Correia 1998). WATER 21, conducted by the same network of research institutions, dealt with the sustainability of water policies. The results of this project are not yet published in book form but some can found in Correia (1999) and Zabel and Rees (1999). This project places water-related decision processes and institutions at the heart of the analysis of the sustainability of water policies. A brief description of these projects can be found in Correia (2000). The application of the main concepts and methodologies to the appraisal of the sustainability of water policies is presented in Correia (1999 and 2003).

2. Main obligations and achievements of the European Water Framework Directive

For the first time in Europe, a common framework for the management of water resources is put forward in the Water Framework Directive (WFD). Furthermore, this common framework relates not only to common guidelines for planning and monitoring but also to the institutions that are responsible for water management at the highest level.

The WFD corresponds to an integrated view on water problems for three main reasons. Firstly, the Directive has the purpose of establishing "*…a framework for the protection of inland surface waters, transitional waters, coastal waters and groundwater …*" (Article 1). This approach is based on a space-based integration, which is reinforced by taking the river basin and the river basin district as the appropriate basis for ensuring the application of the rules of the directive (Article 3) and for the implementation of programmes of measures (Article 11) and management plans (Article 13). This is valid, with required adaptations, for international river basins.

Secondly, the directive promotes an integrated view and characterisation of the economic activities and their impacts (Article 5 and Annexes II and III) within the scope of each river basin district. This approach will build on a better understanding of the social and economic fabric and its relation to water uses. The use of economic instruments for water management, and the consideration of the principle of recovery of the costs of water services, including environmental and resource costs, reinforces this integrated view of water and economic activities.

Thirdly, the main purpose of the Directive is to prevent further deterioration and to protect and enhance the status of aquatic ecosystems, aiming at achieving good water status with ecological status playing a crucial role in this aim (Article 1). This is a recognition of the ecological value of water bodies as a guarantee of long-term protection of available water resources which leads, in fact, to a much more closely integrated approach compared to a more traditional view of water simply as a resource for given uses.

Integration is in fact a key concept underlying the WFD. Beyond the three main dimensions of integration mentioned above, it is interesting to reproduce the nine (!) entries presented in a report of the Common Strategy on the Implementation of the Water Framework Directive (EC 2002a). These are shown in Box 1.

The WFD provides general guidelines on the institutional setup, although it leaves to each Member State the precise definition of how to adapt its institutional tradition and current situation to the new requirements of the Directive. The Directive also provides a common framework for the monitoring of surface and groundwater status, with special emphasis on the ecological quality of water bodies, and for the information and reporting mechanisms associated with it.

It will be interesting to observe how this common framework will be implemented in a region of the world known for its physical and institutional diversity. In fact, this is the main challenge of the WFD, although the directive is very flexible and can be compatible with very different institutional setups.

It is also interesting to observe that this is a long-term directive with provisions that will be implemented over a period of up to 30 years. In Table 1, adapted from Chave (2001), the overall timetable for implementation of the WFD is presented.

It will be fascinating to follow the implementation of the WFD in the 25 Member States (or more!) in the coming years. This will be the most lively and interesting laboratory for experimenting with water policies within a common framework but reflecting the inevitable diversity that is intrinsic to European nations in terms of biophysical, socio-economic, legal, historical and institutional characteristics. Different solutions to common problems and similar solutions to very different situations will be the motto in the coming years. Once again, the flexibility of the Directive should be underlined and, in fact, it may be seen as a necessary feature for its success.

Box 1 – Dimensions of integration of the WFD, according to (EC 2002a)

Integration: a key concept underlying the Water Framework Directive

The central concept to the Water Framework Directive is the concept of integration that is seen as key to the management of water resources within the river basin catchment:

- **Integration of environmental objectives**, combining quality, ecological and quantity objectives for protecting highly valuable aquatic ecosystems and ensuring a general good status of other waters;
- **Integration of all water resources**, combining fresh surface water and groundwater bodies, wetlands, coastal water resources **at the river basin scale**;
- **Integration of all water uses, functions and values** into a common policy framework, i.e. investigating water for the environment, water for health and human consumption, water for economic sectors, transport, leisure, water as a social good;
- **Integration of disciplines, analyses and expertise,** combining hydrology, hydraulics, ecology, chemistry, soil sciences, technology engineering and economics to assess current pressures and impacts on water resources and identify measures for achieving the environmental objectives of the Directive in the most cost-effective manner;
- **Integration of water legislation into a common and coherent framework.** The requirements of some old water legislation (e.g. the Fishwater Directive) have been reformulated in the Water Framework Directive to meet modern ecological thinking. After a transitional period, these old Directives will be repealed. Other pieces of legislation (e.g. the Nitrates Directive and the Urban Wastewater Treatment Directive) must be co-ordinated in river basin management plans where they form the basis of the programmes of measures;
- **Integration of all significant management and ecological aspects** relevant to sustainable river basin planning including those which are beyond the scope of the Water Framework Directive such as flood protection and prevention;
- **Integration of a wide range of measures, including pricing and economic and financial instruments, in a common management approach** for achieving the environmental objectives of the Directive. Programmes of measures are defined in **River Basin Management Plans** developed for each river basin district;
- **Integration of stakeholders and the civil society in decision making,** by promoting transparency and information to the public, and by offering an unique opportunity for involving stakeholders in the development of river basin management plans;
- **Integration of different decision-making levels that influence water resources and water status,** be local, regional or national, for an effective management of all waters;
- **Integration of water management from different Member States,** for river basins shared by several countries, existing and/or future Member States of the European Union.

Table 1 - Overall timetable for implementation of the WFD

Action	Date
Transpose Directive into national legislation	2003
Define river basins, appoint competent authorities	2003
Complete surveys	2004
Commence monitoring programmes	2006
Statement of issues	2007
Publish draft of river basin plans for consultation	2008
Commence river basin plans	2009
Enact programme of measures	2009
Introduce water pricing	2010
Implement all programmed measures	2012
Achieve good water status in most waters	2015
First review of river basin plans	2015
Second review of river basin plans	2021
Where extensions apply achieve good water status	2027
Third review of river basin plans	2027

The main obligations and stepping-stones of the directive can be briefly outlined as follows:

Basic institutional set-up

By the end of 2003 all Member States must have identified individual river basins and groundwaters, assigned them to individual River Basin Districts and identified competent authorities for the application of the rules of the Directive. This also needs to be done for shared and international river basins (Article 3).

River basin characteristics

By the end of 2004 analysis of individual river basins must be completed, including characterisation of the pressures, impacts, and economics of water uses, and a register of protected areas within the river basin district (Article 5 and 6, Annexes II and III). This characterisation is especially demanding and innovative in terms of the ecological characterisation of water bodies, which is necessary for the definition of

environmental objectives. Two systems may be used, according to Annex II: System A based on large European ecoregions, and System B based on a more specific analysis of the water body under consideration. The characterisation of river basin districts also includes a demanding and innovative economic analysis of water uses. Broad guidelines for this analysis are presented in Annex III.

Monitoring procedures

The monitoring of surface water status, groundwater status and protected areas must be in operation by 2006 (Article 8). Such monitoring shall be in accordance with the requirements of Annex V. The ecological components of this monitoring are especially demanding and innovative.

Environmental objectives

According to Article 4 of the WFD, all member States should achieve good surface water status or, in the case of heavily modified or artificial water, good ecological potential and good chemical status by 2015. Annex V specifies the elements that need to be considered for different types of water bodies, the definitions for different levels of quality status and the main procedures to be adopted in monitoring the status. The programme of measures is the instrument to achieve this goal in operational terms.

Economic instruments

According to Article 9, water pricing policies that enhance the sustainability of water resources will be implemented by 2010. More specifically, Member States will ensure that water pricing policies provide adequate incentives for water users to use water resources efficiently, and thereby contribute to the environmental objectives of the Directive, and an adequate contribution of the different water uses, disaggregated into at least industry, households and agriculture, to the recovery of the costs of water services, based on the economic analysis previously conducted according to Annex III and taking account of the polluter pays principle. As a safety valve it is stated that Member States may in doing so have regard to the social, environmental and economic effects of the recovery as well as the geographic and climatic conditions of the region or regions affected.

Programme of measures

Based on the analysis of the characteristics of the river basin districts and on the monitoring mentioned above, the Member States will prepare by 2009 a programme of measures for each river basin district aiming at achieving the ambitious environmental objectives of the WFD (Article 11 and Annex III). Those programmes will be operational not later than 2012 and may be reviewed and updated by 2015.

River basin management plans

For each river basin district, a river basin management plan will be produced by 2009 and reviewed and updated by 2015, according to Article 13 and Annex VII. These plans will include a description of the characteristics of the river basin district with respect to surface waters and groundwaters, a summary of significant pressures and impact of human activity on the status of surface water and groundwater, the identification and mapping of protected areas, a map of the monitoring networks, a list of environmental objectives for the various water bodies, a summary of the economic analysis of water use in the river basin district, a summary of the programme or programmes of measures within the river basin district, a register of any more detailed programmes and management plans dealing with particular sub-basins, sectors issues or water types, together with a summary of their contents, a summary of the public information and

consultation measures taken, a list of competent authorities responsible for the application of the Directive within the river basin district, and the contact points and procedures for obtaining background documentation and information. These plans are of a comprehensive nature and they bring together all relevant information, objectives and measures deriving from the implementation of the Directive in each river basin district. Like the programme of measures, they will be reviewed for the first time not later than 2015 and every six years thereafter. The overall objective of the WFD is to achieve good water status for all water bodies in the EU territory by 2015. However, this objective may be impossible to achieve in some well-justified cases for reasons of technical feasibility, disproportionate cost or natural conditions. The six-year cycles of reviewing the planning and programming of measures are intended to achieve that objective over a longer time span.

Information, consultation and participation

The active involvement of all interested parties in the implementation of the Directive and development of river basin management plans will be encouraged, according to Article 14. By 2006 the Member States will inform and consult the public, including users, on the timetable and work programme for the production of the river basin management plans. An overview of significant water management issues will be presented to the public by 2007 and a draft of the river basin management plans will be presented before 2008.

3. Diversity in water availability, needs and use in Europe

There are immense and striking differences in water availability, needs and use throughout Europe. In many ways and by different means these differences need to be taken into consideration when a general framework for water management such as the WFD is put forward.

There are many sources of information on these differences, but the pioneering work of Cunha (1993) should be mentioned for its novelty and forward-looking approach. Additional references on this topic are to be found in EEA (1998, 1999, 2001, 2003). It is not appropriate in this article to review all these issues but it is interesting to recall just a few of them in order to emphasise the complexity of devising common policies for such a diverse reality.

Rees et al. (1998) present a synthesis of the main hydrological characteristics that impact on the institutional framework of six selected countries that are considered representative of various regions in the European Union. These characteristics are presented in Figure 1. Simple facts such as being an upstream or downstream country or the prevailing use of water may have a significant impact on the way water management institutions are organised.

The mean annual water availability per capita in 28 European countries is presented in Figure 2, taken from EEA (1998). It is no surprise that in at least 10 countries a significant proportion of the resources are generated outside the country. In some cases there is a large difference between those values. For instance, Hungary has an “above medium” total availability but when only internal resources are considered the availability is classified as “very low”. Similar extreme situations are found with the Slovak Republic and Croatia. The Netherlands has a total availability in the “medium” range but comes in the “very low” band when only internal resources are considered. Portugal is also in the “medium” range for total resources but is classified as “low” for internal resources. It is clear that transboundary water issues and the management of international river basins are crucial issues in Europe. It is also clear that per capita availability varies from less than 2 000 m^3 in Belgium to more than 22 000 m^3 in Finland. These are huge variations, which by themselves could be responsible for very different approaches to water management.

The percentages of water used by each sector in each of the 15 current EU Member States are displayed in Figure 3, taken from EEA (1995). It is interesting to note that agriculture uses more than 70% of water in Spain while this water use is negligible in countries like Belgium or Luxembourg or plays a minor role in countries such as Germany or Sweden.

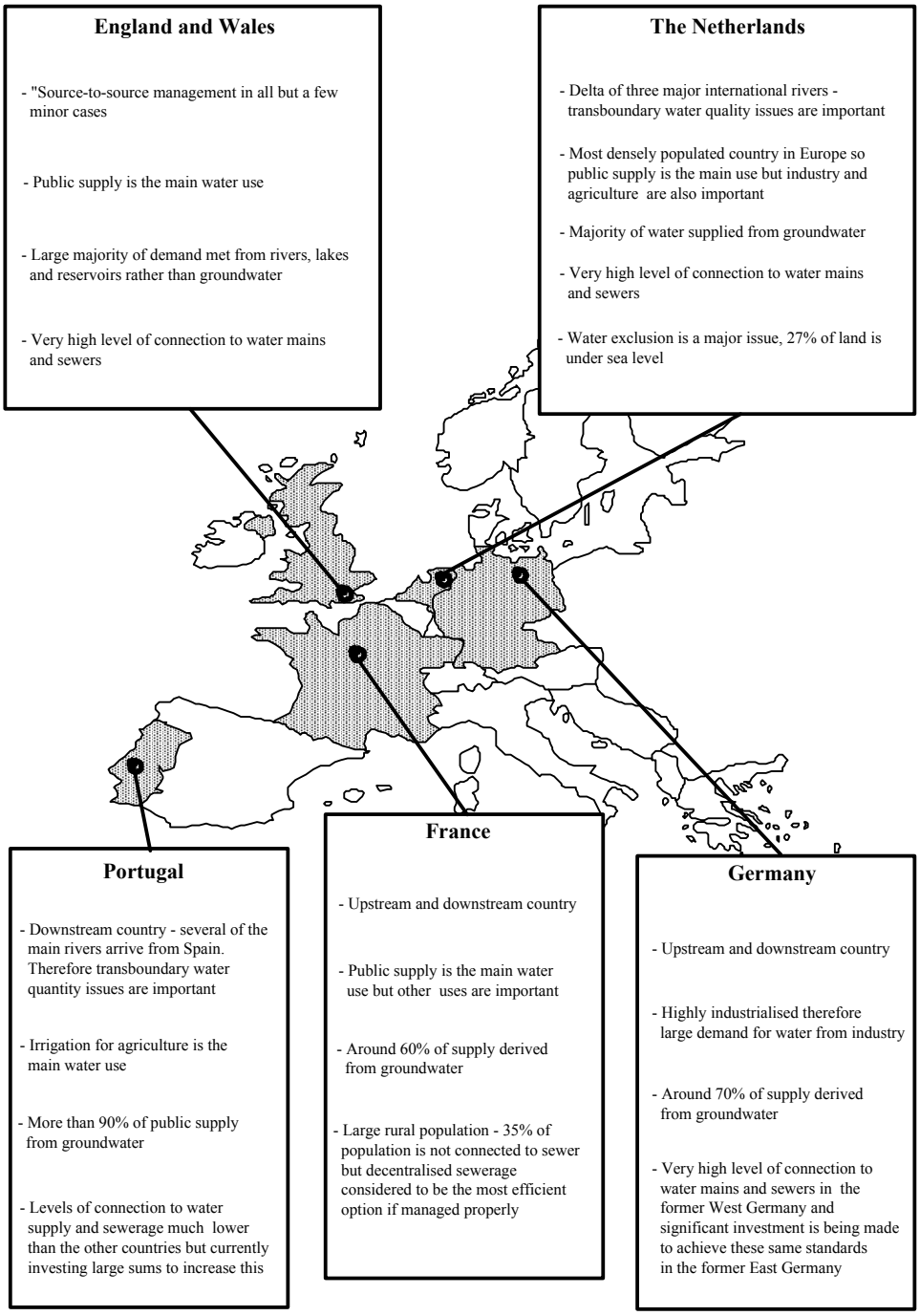


Figure 1 – Main hydrological characteristics in five EU Member States (from Rees et al. 1998)

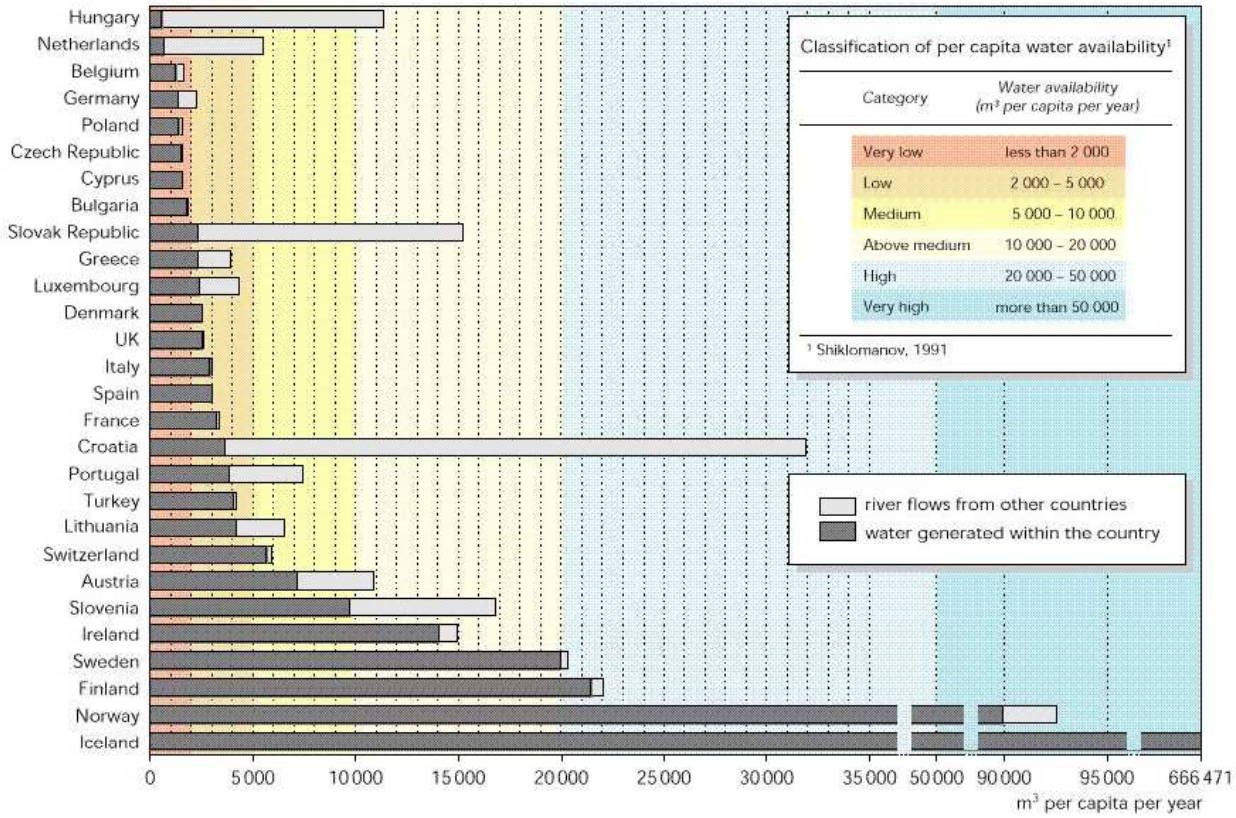
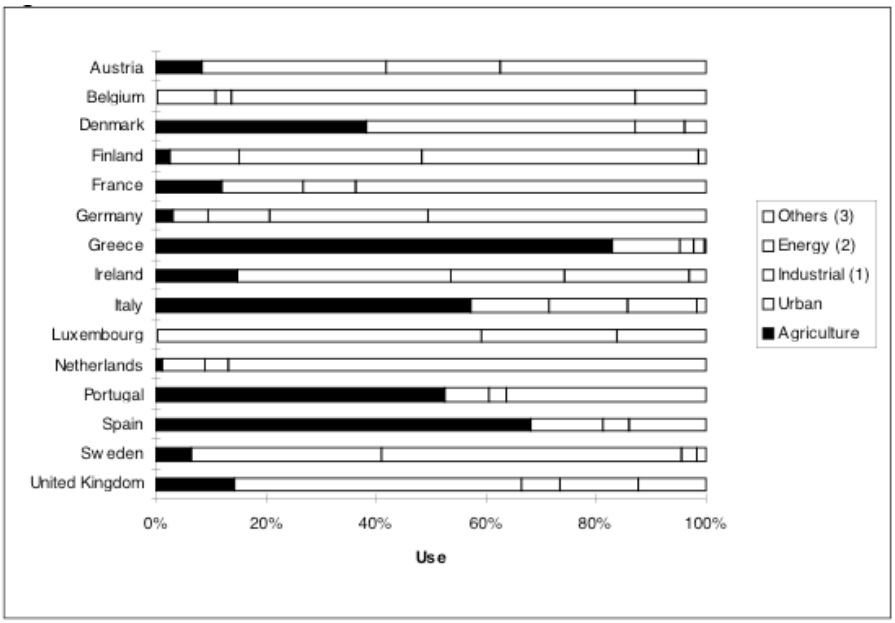


Fig. 2 – Freshwater availability in m^3 per capita per year in 28 European countries, considering water generated within each country and river flows from other countries (from EEA 1998)



(1) Excluding water for cooling
(2) Water for electricity generation including cooling water and hydropower
(3) Others – remaining volume of total abstracted water, used for undefined, other uses.

Figure 3 – Sectoral use of water in EU 15 Member States (EEA 1999)

It can be seen that agriculture is a very important water user sector. Therefore, the development of this economic sector may have a dramatic impact on water management, in some cases dictating the difference between water availability and water abundance. In Figure 4, agricultural use of water in three regions of Europe is presented (EEA 2003). Water use by agriculture is still tending to rise in western southern European countries, is slowly falling in western central countries, and had a sharp decline in the accession countries of central Europe, mainly due to the economic crisis experienced by those countries in the last decade.

The pressure put on the resource can be measured by the water exploitation index (WEI). This is the percentage of the available resources that is abstracted. These values for 31 European countries are presented in Figure 5, taken from EEA 2003. It is considered that a non-stressed situation occurs if the WEI is less than 10%. When abstraction for energy cooling is not considered, this is the case of Iceland, Norway, Latvia, Hungary, Lithuania, Slovakia, Sweden, Bulgaria, Slovenia, Ireland, Finland, Switzerland, Austria, The Netherlands, Estonia, Luxembourg, France, Poland, Germany, the Czech Republic, and England and Wales. It is considered that low stress occurs when the WEI is between 10 and 20%. This is the case of Romania, Greece, Portugal, Denmark, Turkey, and Belgium. Stressed countries are those in which WEI is above 20%, which is the case of Italy, Spain, Malta and Cyprus.

Wastewater treatment is a key factor in water quality, requiring significant investments and operational costs that are needed to achieve good quality status. Significant progress has been made in Europe but important differences still remain among European countries, as is demonstrated by Figure 6, taken from EEA (2003). The percentage of treated sewage is close to 90% in Nordic and central countries with tertiary treatment becoming predominant in the late 1990s. In the southern countries and in the accession countries the percentage of treatment is close to 50%, although a secondary type of treatment prevails.

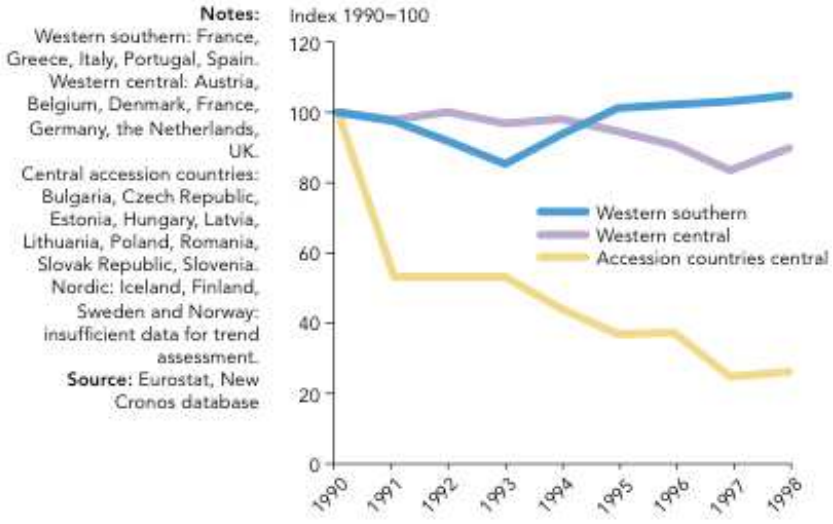


Figure 4 – Agricultural use of water in three regions of Europe (EEA 2003)

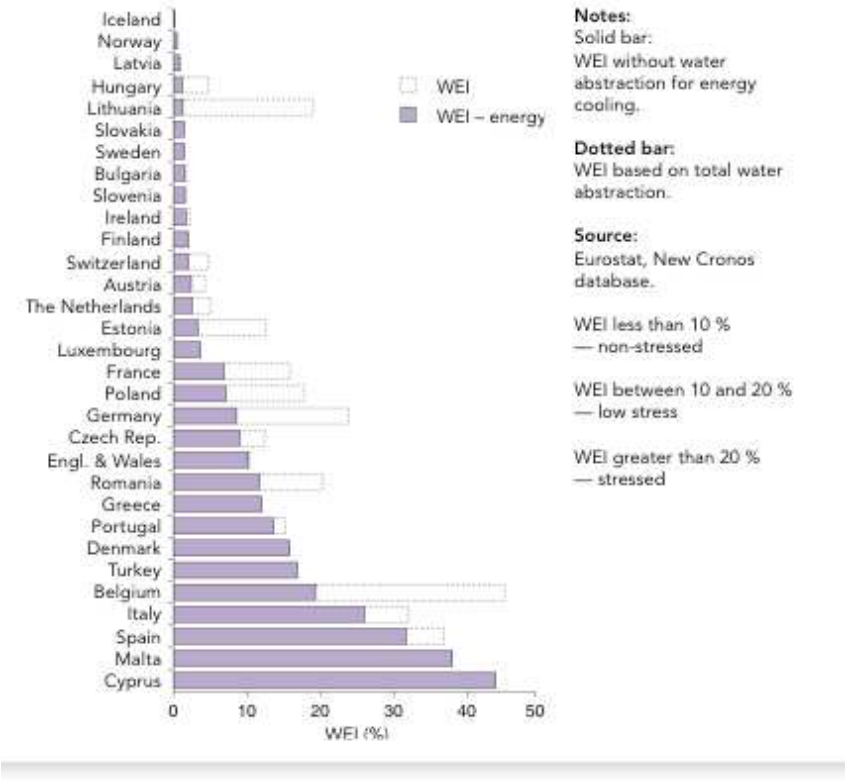


Figure 5 – Water Exploitation Index (WEI) across Europe (EEA 2003)

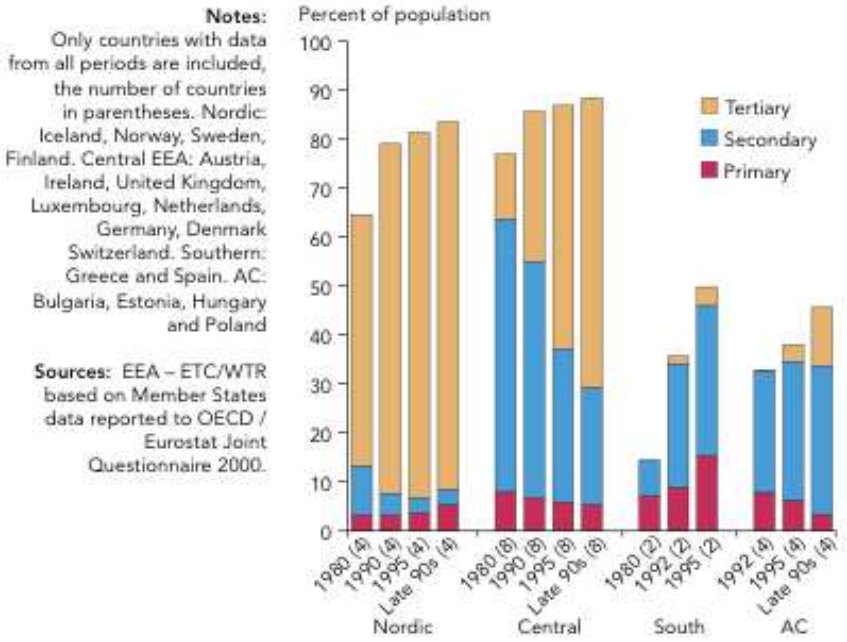


Figure 6 – Wastewater treatment in Europe between the 1980's and late 1990's (EEA 2003)

4. Water institutions and contextual analysis of water issues

Water resources management in the 21st century, in Europe and elsewhere, requires not only solutions to engineering problems typical of a traditional approach, but also a better understanding of the contextual processes involved in policy formulation and an appraisal of those processes. In simple terms, it matters not only *how* questions are answered, in a simple technical approach, but *which* questions are asked, which requires a better understanding of society and its formal and informal decision processes. Institutions are obviously a key element in the decision process.

Water is an essential requisite for development and an essential element of all ecosystems. It is also the subject of a complex and diversified industry. As a result of its nature and importance in virtually all areas of economic activity, water is the object of sensitive policies with impacts across many areas of social life, especially in water-stressed areas. The path to sustainable development cannot, and will not, exclude new water policies. Therefore, an analysis of sustainable water resources management needs to pay attention to the formulation of water policies and to the institutions involved in policy formulation and in its implementation.

An integrated approach to water resources management must take into consideration the complexity of the multiple relationships between water and society, as can be seen in Figure 7 (Correia 1999 and 2003; Zabel and Rees 1999).

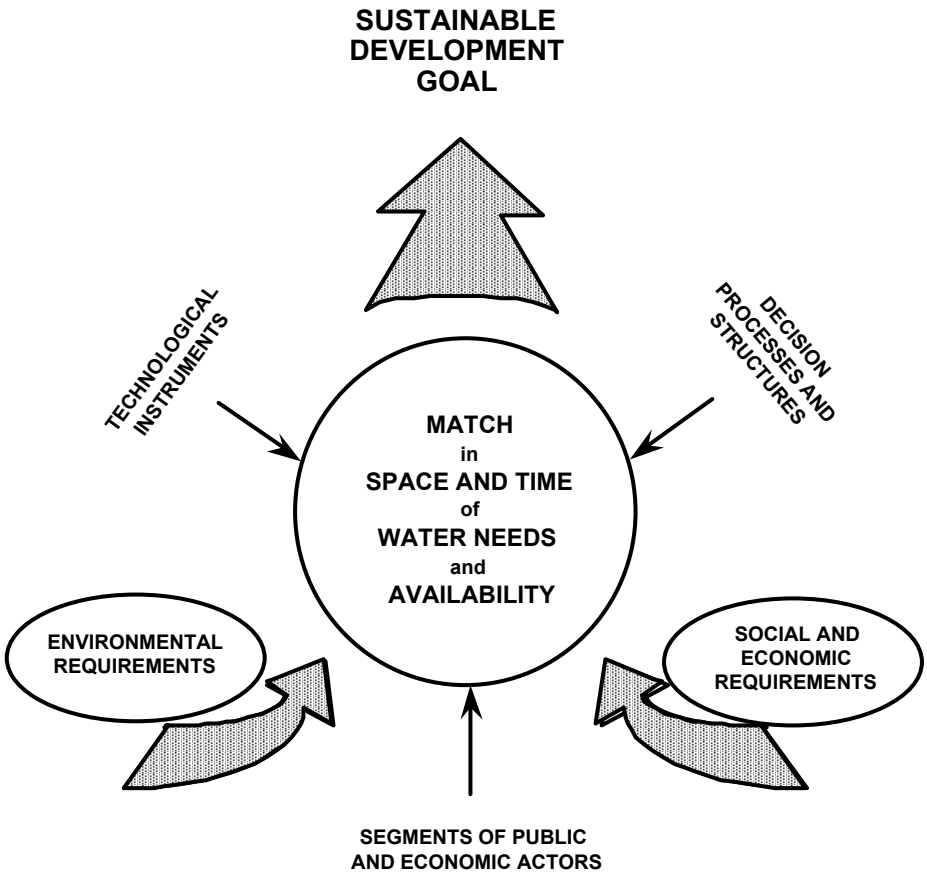


Fig. 7 - Complexity of water policy formulation and its contextual elements (from Correia 1999)

The basic objective of water resources management has always been to match water needs and water availability, in space and time, in terms of quantity and quality. This is the hard core of water management and, to a large extent, the traditional objective of water engineering. There is much that needs to be done and improved in this area of engineering but it has become quite clear in recent years that dealing with water problems requires this picture to be broadened and other fields of expertise to be considered.

The context of policy formulation relevant to water resources management and the institutions that support policy formulation and implementation vary considerably from case to case, but there are some common aspects that should be analysed and emphasised. Firstly, the requirements established by society need to be considered. These requirements lead to the formulation of immediate or short-term goals and are greatly influenced by the perceptions and attitudes of decision-makers and the general public. Two important types of requirements for water management need to be considered and analysed:

- *Social and economic requirements*;
- *Environmental requirements*.

The formulation of water policies is a complex and dynamic process, to a large extent driven by forces that are deep-rooted and often poorly understood. A complete analysis of these highly dynamic policy formulation processes and related institutions is very complex and changes significantly from one society to another. However, in general terms there are three main driving forces that must be considered:

- Science and technology available to professionals and decision-makers;
- Decision-making processes and structures;
- Relevant actors and various segments of the public.

According to the approach presented above, a *contextual analysis* of water issues must identify and characterise the *requirements* of water management and the *driving forces* of policy formulation, as shown schematically in the figure.

A) Requirements

Social and economic requirements

Water must fulfil some essential needs, regardless of the institutional system historically adopted in each country for its management. Water is a resource with many uses and the basis of many economic activities. These factors are related to the social and economic requirements for water. Some of these requirements are voiced by specific water use sectors, such as hydro-power, irrigation or fish farming, and some cut across society, such as domestic water supply and wastewater treatment.

Environmental requirements

Water systems are not only supply sources but also important environmental bodies essential for the sustainability of virtually all ecosystems. Water bodies must be managed according to complex legislation and environmental obligations at the national and supra-national levels. Both of these types of requirements evolve over time and must be taken into consideration when analysing the formulation of water policies. Naturally, these aspects are relevant to environmental requirements.

Among the elements affecting the formulation of water policies in a specific society, there are three important *driving forces* that always contribute significantly to shaping water policies. These driving forces, briefly presented in the previous section, are technological instruments, decision processes and structures, and the segments of the public and other relevant actors.

B) Driving forces

Segments of the public and economic actors

In order to understand the context of water resources management, it is essential to identify and characterise the segments of the public affected by water policies, with special emphasis on the economic actors involved in water use and water management, such as industry, agriculture, hydro-power production, domestic water supply, waste water treatment, environmental protection, tourism and recreation. The relationship between these actors is sometimes consensual, sometimes based on conflicting interests. Their weight in the process of formulating policies evolves over time and this frequently explains shifts in water policies. The ways in which the needs of all these actors are satisfied, and the balance that is achieved between the satisfaction of those needs and environmental protection, are determining factors of water policy formulation and water resources management.

Technological instruments

It is true that science and technology help solve problems. However, they also play a critical role in the way problems are formulated. Technological development has a direct impact not only on the quality of the answers given to existing problems, but also in the way these problems are perceived and analysed. This means that science and technology not only help in shaping the answers that are given but also help to establish the domain of the questions that are asked. Technological instruments are closely interconnected with the problems that they are intended to solve in a way that is reminiscent of a supply/demand relationship. This is very clear with respect to many aspects of water problems. The new type of problems that have arisen since GIS became available is just one example. Therefore, the relationship between technology and water policy formulation deserves attention in the context of sustainable development analysis and needs to be considered when analysing the response of a given society to water problems.

Decision processes and structures

Decision agents and decision structures and procedures are important driving forces of the water policy formulation process and a key element of contextual analysis of water. Institutions are recognised as being essential for WRM and institutions are in fact largely based on representation and decision powers. Who decides what, at what level, based on which information, are just a few of the questions deserving attention. How is power distributed at different levels of organisations and in society in general? The role that different actors play in the various formal and informal decision arenas is essential to understanding how water policies are formulated and how WRM is mastered. Participation is a key concept in this analysis. Integration of policies between water-use sectors is another dimension of decision-making processes that deserves attention.

In modern societies, matching water needs and water availability cannot by any means be seen as the ultimate goal of water management. As stated above, water must be seen as an important resource that plays a crucial role in the implementation of a sustainable development model in our societies. Therefore, analysis of the requirements and driving forces of water policy formulation should be considered from the perspective of how they can help, or hinder, the achievement of sustainable development. This analysis should be based on criteria or indicators that provide guidance in the identification of bottlenecks and in the formulation of more appropriate policies.

Sustainable development is still a somewhat complex concept if it is to be expressed it in precise and verifiable terms. Concerning water management policies, criteria for defining sustainability are still more

complex to define because water interacts with virtually all economic activities and environmental components.

To understand the context of water policy making and to identify sustainable patterns of water resources management, it is important to have a good knowledge of water institutions and water policies in various countries. There are significant differences from country to country even in a well-defined region of the world such as Europe. Water is valued in different ways, the weights of water-use sectors are different, and institutions responsible for water management are greatly influenced by the historical and cultural roots of each society.

As mentioned in section 1, a group of European universities and research institutions (IST from Portugal, LATTS/ENPC from France, Ecologic from Germany, RBA/TU Delft from the Netherlands and WRC from the United Kingdom) has conducted two comparative studies, titled EUROWATER and WATER 21, dealing with the institutions for water resources management, the processes for water policy formulation, and the criteria for the sustainability of those policies in the European Union. These projects place water-related decision processes and institutions at the heart of the analysis of the sustainability of water policies. The results of these studies are partially documented in two volumes that contain substantial information on water issues and dilemmas in Europe (Correia 1998). A brief description of this initiative can be found in Correia (2000). The application of these concepts and approaches to the appraisal of the sustainability of water policies is presented in Correia (1999 and 2003) and in Zabel and Rees (1999).

5. Water ownership and water rights in Europe

Water institutions in Europe present a degree of diversity that surpasses the diversity of the biophysical characteristics of its water resources and related environments.

Institutions are not an end in themselves. On the contrary, they have an instrumental nature and serve purposes, as they are perceived by society at a given stage. Society has multiple and often contradictory interests and views on water issues and, therefore, institutions reflect these multiple and contradictory views and their relation with political power.

To a large extent, and taking a broad view, it can be stated that water resources management institutions reflect society, its actors with their respective goals, its fractures and its balances of power. Thus it is no surprise that water institutions are so diverse in Europe although they emerge from deep-rooted trends in history, culture and politics. The result is that the existing diversity can be interpreted in terms of the social movements and historical evolution of each society, with each case being unique but part of a larger process of interlinked influences across borders, like any other area of social organisation.

It has been said that the degree of civilisation of a given society can be inferred from how that society manages its rivers, which is clearly an exaggeration but still makes a valid point. However, institutions also influence the evolution of society as they provide formal arenas for the exercise of power and for the confrontation and resolution of conflicting interests.

The concept of coevolution, introduced by biologists and later extended to the social sciences as an analogy to analyse the relationship between human society and nature and the evolution of institutions (Norgaard 1984, 1994, Axelrod 1997, Ostrom 2000), can certainly be applied to the relationship between a given society and its water institutions.

When we look at the origins of water institutions we find a fundamental issue that transcends the specific configurations of those institutions and remains a key factor in shaping its evolution. That issue is the ownership of water and the right of access to water by different users.

There are basically two deeply rooted water cultures in Europe: one that emphasises the concept of common property and the role of each community involved in managing this common resource, and one emphasising the role of the state and its formal law in managing what may be seen as a public good.

The first approach is very much present in the Celtic and Germanic cultures. Subsidiarity can be seen as a key concept in favour of this approach as it confers a subsidiary role to the state and prefers as much as possible for the community of users to deal with their problems among themselves. The *waterschappen* (water-boards) in the Netherlands are a typical example of this approach.

The second approach is more common in southern Europe and has its roots in Roman law, often reinforced by the Napoleonic heritage of the states of central Europe. In these cultures water tends to be seen as a public good and the role of the state in the management of that good is emphasised.

However, Roman law cannot be simply equated with public ownership of water because, in fact, it considered several regimes of water appropriation. As Barraqué (1998) describes in a thoughtful and well-researched paper, Roman law basically considered three types of water: the *res comunis omnium*, the *res publicae* and private water generally associated with the land ownership.

The influence of these categories, has lasted until today, although the influence of Roman law was not a direct one because, in fact, it became stronger after the Middle Ages when it was copied and compiled. It was the backbone of legislation in Renaissance cities and became the prevailing approach in the Enlightenment, being exported to other continents by European colonial powers, particularly Portugal and Spain.

Caponera (1992) points out that civil law, typical of the French tradition, and common law, very strong in the English tradition, can both be traced back to Roman law, although common law fits well, and strengthens, the tradition of common ownership that is dear to northern cultures.

It is clear that in modern societies the concept of sustainability, and its derived practices, require new forms of relationship between water authorities, operators, and users, that are increasingly based on usership rather than on ownership. The narrow limits of land ownership are not appropriate for efficient management of such a mobile resource as water, even for groundwater resources. In fact, even the rights of land ownership have become very restricted and subject to severe limitations imposed by urban development rules in the name of the prevailing public interest, making traditional disputes between 'public' and 'private' to some extent outdated.

The concepts, and the associated tools, of planning, licensing, and the implementation of the users-pay-principle, among others, have indeed become the backbone of contemporary water administration and, simultaneously, strengthen the role of the state in the process of managing water. Nevertheless, these concepts and tools still face deeply-rooted traditions and institutions and need to be adapted to different water cultures throughout Europe.

One of the merits of the Water Framework Directive is that it clearly reinforces the role of the state in performing key functions of water management without contradicting or discarding the traditions and institutions that were forged in each Member State throughout history. In fact, the WFD governs the higher segment of public intervention, harmonising the practices of water authorities in the various countries, without excluding other forms and other levels of organisation that may be important in the process of negotiation between water users.

It is easy to recognise that common law and communities of users may be an inadequate way to promote the sustainable use of resources. It is also clear that the stress put on water resources and on water environments means that water can no longer be considered *res nullius* as it was in the past in many water-abundant cultures. The classic paper by Hardin (1968), "The Tragedy of the Commons", is there to remind us of the inadequacies of these approaches and the need for higher levels of regulation.

However, it is possible that the evolution of water institutions in Europe will lead to an interesting synthesis of these two deeply-rooted traditions: on one hand a clear role for public authorities organised in different levels up to the EU level; and on the other hand, the creation or strengthening of river basin "communities of users" that may play a key role in building consensus among users and autonomously

carry out various aspects of water management under a framework of duties and goals imposed at a higher level.

The Dutch *waterschappen* mentioned above, the French local water communities, the Portuguese and Spanish river basin councils and traditional irrigation organisations such as the Valencia water court, may constitute a significant step forward in subsidiarity applied to water management, although in some cases they are based on traditions that are hundreds of years old. Interestingly enough, all these organisations are compatible with the WFD, if not desirable for the full accomplishment of the directive.

6. Other institutional issues relevant to European water resources management

In the previous sections, the contextual analysis of water policy formulation, and the deeply-rooted concepts of water ownership and rights, are highlighted as being important factors that help to explain the substantial differences in water management institutions in Europe. Without intending to be exhaustive, some other elements can be presented as important for understanding those differences.

Table 2, adapted from Rees et al. (1998), presents a summary description of the main players, the water and wastewater services and the mechanisms for water management in the five EU countries considered in the EUROWATER project mentioned in section 1 (Correia, Ed. 1998). The key issues of water management in these countries are summarised in Figure 8.

7. Concluding remarks

Institutions in the water sector, as probably in many sectors, are the result of a slow process of evolution and adaptation. They serve specific purposes and reflect balances and tacit agreements among social actors. In many circumstances they need to be reformed, but this cannot be done without serious consideration of the contextual factors that determine specific forms of organisation and governance.

Institutions for water management in Europe present a high level of diversity that in many cases surpasses the high level of hydrological and ecological diversity. Therefore, it is a stimulating challenge to promote a common policy to deal with water resources management and to implement harmonised action to achieve common and ambitious goals.

The Water Framework Directive raises such a challenge with flexibility but with firm principles to be observed by all Member States. Allowing a large degree of institutional choices, it assumes the subsidiarity principle as a guiding principle for the reform of water management practices throughout Europe.

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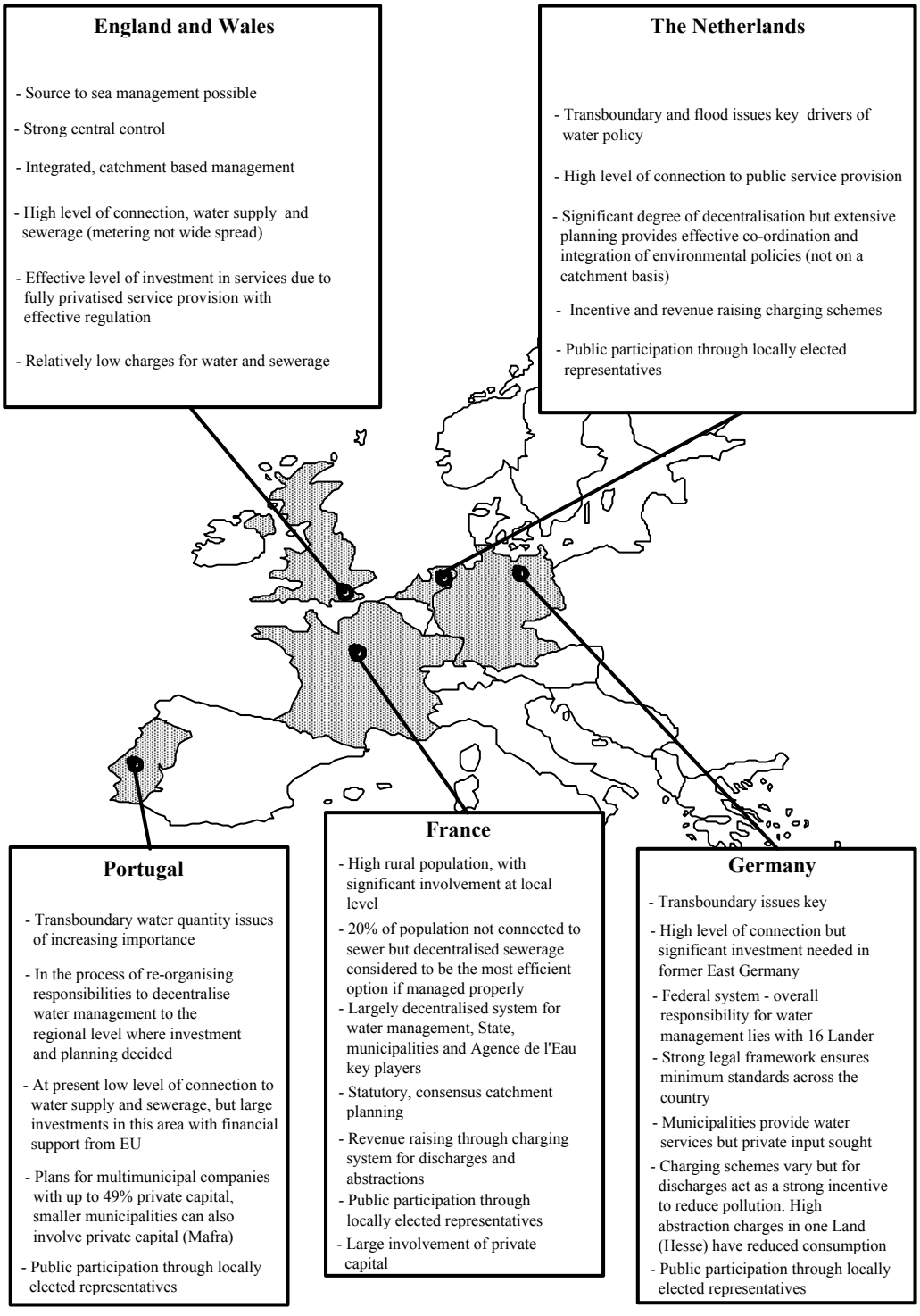

Fig. 8 - Summary of key issues in five selected EU Member States (from Rees et al. 1998)

Table 2 – Overview of water resources issues in five EU member States (adapted from Rees et al. 1998)

Member State	Main Players	Water and Wastewater Services	Mechanisms for Water Management
England and Wales	• In England and Wales, one Ministry (DoE) has the main responsibility for water management • National regulators, EA (catchment based management of the aquatic environment and industrial pollution), OFWAT (economic regulation), DWI (drinking water quality) • EA – multifunctional – integrated water management • Public participation through committees, consultation and registers • Appeals against licence conditions to DoE • Different institutional arrangements in Scotland and Northern Ireland	• Only 7% of domestic customers have meters • 10 private water and sewage companies and 21 water only companies • Fully privatised water sector. Natural monopolies countered by the creation of an economic regulator charged with a duty to protect customer interests • Large proportion of the population connected to water supply and sewerage network • Price cap system employed for setting charges • Charges have increased to fund investment over the last few years	• Catchment plans used as the key to reaching consensus on future priorities and to guide in decision making • Discharge licensing for all discharges. Environmental Quality Standards (EQS) are minimum standards, but Uniform Emission Standards (UES) are applied for the most polluting industries if these are more stringent than the limits to meet the EQS • Abstraction licensing for all uses • Charging schemes aim to recover the costs of administration and monitoring
France	• Main Ministry, MoE, but significant roles for other ministries • *Prefet* at *Département* level is responsible for licensing abstractions and discharges • *Police de l'Eau* are responsible for monitoring water management activities (representing many ministries) • *Agences de l'Éau* collect charges for abstraction and discharge and redistribute the funds as loans or subsidies for abatement • Municipalities responsible for water and wastewater services but large involvement of private water companies • Public participation through locally elected representatives	• Variety of approaches adopted combining standing charges and volume used but metering is widespread • Around 80% connected to sewers, the remaining 20% will retain decentralised sewage treatment • Large involvement of private capital through a system where the operation is contracted out to private companies under public management • Charges depending upon contract • Price rises forecast in order to finance capital investment	• Statutory catchment and sub-catchment plans based on consensus • All discharges require a licence, UES are applied as minimum standards • All abstractions require a licence • Charging schemes for revenue raising
Germany	• Federal Ministry of Environment has the main role but other ministries have major roles • *Länder* (States) have overall responsibility for water management • LAWA has an important co-ordination role • Regulation at state, regional and local level • Municipalities responsible for water and wastewater services • Minor role for private capital but water supply companies operated like private companies • Public participation through locally elected representatives and administrative courts • Appeal against regulatory decisions through administrative courts	• Metering is extensive – 91% of charges are related to volume consumed whilst 9% is for the standing charge • 98% of population connected to sewers • Water services provided by municipalities but some input of private capital is sought • Charges raised by municipalities • Significant investment needed particularly in the former East Germany	• Planning encouraged but so far not really accepted, only for major, plus a few minor rivers • All discharges require a licence, UES are minimum requirement and it is the policy of water authorities to discourage discharges directly to water • All abstractions require a licence • Effluent charges based on an incentive scheme to encourage pollution reduction by increasingly strict use of 'Best Available Technology' • Abstraction charging varies from *Land* to *Land*

Table 2 (continuation)

Member State	Main Players	Water and Wastewater Services	Mechanisms for Water Management
Netherlands	• Major roles for several ministries • National regulator (RWS) responsible for state waters but regional/local management for non-state waters • Publicly owned companies provide water services and publicly owned water boards provide sewage treatment but municipalities responsible for sewage system • Public participation through locally elected representatives and administrative courts • Appeals against regulatory decisions through administrative courts	• Water prices are standing charge and volume related • Over 90% of population connected to sewers • Sewerage services provided by water boards but sewerage system responsibility of municipalities. Water supply by publicly-owned companies • Water and wastewater levies raised by the State, provinces, water boards and municipalities • Charges have increased significantly to fund investment over the last few years	• Extensive planning but not on catchment basis – essential for co-ordination and integration • Discharge licensing for all discharges, UES minimum requirements, stricter requirements can be applied to meet objectives of the plans • Abstraction licences for all uses, but agricultural abstractions from groundwater only need declaration • Charging schemes based on incentive charging and revenue raising • Abstraction charging only for groundwater
Portugal	• Ministry of Cities, Land-Use Planning and Environment (MCOTA) is main ministry but other ministries with significant roles • National organisations are responsible for water policy, water planning and drinking water quality (INAG/IRAR/IA) • The process of reorganising responsibilities to decentralise water management has been going on for the last 15 years with hesitations on a catchment or non-catchment based approach • Regional Directorates (non-catchment based) currently responsible for most water management activities • Municipalities responsible for water and wastewater services but their integration in large multi-municipal companies is being promoted • Multi-municipal companies are publicly owned but 49% can be privatised in the future	• Meters are widespread • Approximately 70% of population connected to sewers with heavy investment made in recent years • Privatisation has played a role in the last decade but did not expand as expected • Expansion of publicly-owned multi-municipal companies has inhibited the privatisation process • Charges set by municipalities and multi-municipal companies where present • Significant capital investment must continue in order to meet EU standards	• 15 statutory catchment plans and one national water plan balance loss of catchment-based administration • UES unless the EQS allow consent limits to be less stringent • Abstraction licensing for all uses is a legal obligation but insufficiently enforced • Charging schemes should have been introduced but are still awaiting complementary legislation • A new water law, partially justified by the need to transpose the EU Water Framework Directive, should be adopted in 2003 and will impose the user-pays-principle

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