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IWRM-NET

**Towards a European-wide exchange Network for integrating research efforts on
Integrated Water Resources Management**

Thematic priority: Integrated water resource management

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European research programmes related to Integrated Water Resource Management



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Integrated Water Resources Management**





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From left to right – Malta Coastline, Killin Falls Scotland, Water of Leith, Scotland, - all ©Trevor Elliot, SNIFFER.

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Executive Summary

Integrated Water Resource Management is being delivered within the European Union through the implementation of the Water Framework Directive. The primary focus of the majority of the public funded research programmes investigated within this document are on the Water Framework Directive but some recognise the limitations of the Directive and are starting to look wider in their scope of research to deliver, what many believe to be the broader aims of IWRM.

IWRM-Net is an FP6 funded cooperation action to facilitate the networking and collaboration between public funded research programmes related to IWRM. The 18 partners within the network have agreed a vision for IWRM-Net, which is to deliver a source of knowledge for research programme managers across Europe and to facilitate a forum for the future development and coordination of research needs, and a communications link between researchers, policy-makers and managers. This forum would also be a place to exchange best practice and improving the knowledge transfer amongst stakeholders in charge of IWRM.

As a means of introducing the subject this report aims to set out the current and completed research programmes within Member states that relate to the subject of IWRM, whether the whole programme is focused on IWRM or just a small part of it. From this list of programmes and the areas that are covered in the programme the idea is to be able to identify the gaps in current knowledge.

The information from each country is designed to present a basic overview of the water resources within that country in terms of volume or number of rivers along with the socio-political structure that governs and manages these water resources. The information is designed to guide the reader towards making assessments on the suitability of the research programmes to take forward the implementation of the Water Framework Directive and the achievement of integrated water resource management.

A basic classification of the research programmes has been implemented using the CIS based classification system which is in chapter 7. This sets out the programmes according to the area of knowledge, such as knowledge of physical processes or economy. Chapter 8 analyses the areas of research covered by the programmes using WFD classifications, the IWRM based classifications set up by the International Office of water during the pre-project phase of IWRM-net and then finally using the CIS classification of chapter 7. This highlights areas for further investigation but does not provide any detail.

Socio-Economic research is an area that is not well covered by the current and past research programmes and is suggested for further investigation. When using the CIS classification it is Crisis management and groundwater management that lacking in research at currently according to the IWRM-Net records and further investigation is proposed to identify and work not recorded.

The further development and analysis proposed will be undertaken in conjunction with the International Office of water who is leading in the development of the Knowledge Management Tool (KMT). The database is the store of basic information and the KMT will then provide a means of presenting and comparing this information within the database. Currently the database holds information on over 160 research programmes across Europe, all with some part related to the management of water

resources. The aim is also to utilise other sets of data which are publicly available such as ERAWATCH, the CRUISE database from the CRUE ERA-net project and SKEP ERA-net project.

The network is also investigating the mechanisms for identifying research needs and comparing these processes the project aims to identify possible challenges in collaborating in research funding.

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1. INTRODUCTION

This document is a ‘map’ of research programmes across Europe that relate to the implementation of integrated water resource management. The first section introduces the concept of era-nets and then the aims and objectives of IWRM-Net are introduced.

The following and main section of the document divides the countries into rough regions based around major river basins and similar geography. This is a rough approximation and is not intended to suggest actual resource management units, but to promote a more integrated approach as one would expect from IWRM. Currently research programmes are very much aligned with nations and in order to tackle water management across boundaries the concept of integrated research is introduced within this document, by the collating of countries on this basis.



Figure 1 : Europe [source UNEP/DEWA/GRID]

Each country is introduced by a number of simple assessments, the first being a Water Resources Assessment, which sets out such values such as volume of usable water and precipitation. The information provided aims to provide a picture on the amount and the state of water in the country.

This is followed by an economic assessment that describes the type of country and the potential uses of water. It is aimed to be an introduction to the pressures on the water resources, by demand from domestic and industrial resources and also an introduction to the capabilities of the country to respond, linking to the next section.

Within the water resource and socio-economic assessments tables are provided which list common indicators. These figures are taken from a wide variety of sources and so each figure has the units labelled and the sources listed below.

The final assessment is legal, regulatory and management, which is intended to investigate the responses to the pressures on the water resource. This will detail the administrative structures, the regulations in place and the processes used to implement water resource management.

These assessments are designed to create a basic picture of the water resource and its management issues that need to be tackled by developing knowledge and expertise.

Within each country section there follows a list of research programmes that tackle water issues. These programmes vary from ones specifically designed to deal with water issues such as the UKTAG WFD programme to those that only have water as a small part of a much larger work such as the Finnish Environmental Cluster research programme.

The development of skills and knowledge is seen as a crucial issue in knowledge based and service centred economies and as such each member state will be striving to develop its own capacities in research management and knowledge management. This document is seen as a start to the process of collaboration in that it starts to map out where the current work is ongoing and through the network of members, IWRM-Net then hopes to find and develop opportunities for collaboration. The collaborations expected will not only improve our knowledge on specific subjects they should look to improve the capacity of members states to manage, undertake and disseminate research and knowledge in sustainable water management.

At the back of the document is some simple analysis on the research programmes and an introduction to the Knowledge Management Tool and the process of identifying research gaps for IWRM-Net partners to consider taking forward.

2 IWRM ERA-NET

2.1 European Research Area (ERA)

The objective of the ERA-NET scheme is to step up the cooperation and coordination of research activities carried out at national or regional level in the Member States and Associated States through:

- the networking of research activities conducted at national or regional level, and
- the mutual opening of national and regional research programmes in specific fields.

The scheme will contribute to making a reality of the European Research Area by improving the coherence and coordination across Europe of such research programmes. The scheme will also enable national systems to take on tasks collectively that they would not have been able to tackle independently. Both networking and mutual opening require a progressive approach. The ERA-NET scheme therefore has a long-term perspective that must also allow for the different way that research is organised in different Member States and Associated States¹. The ERA-NET scheme is aimed at national and regional programme funders and programme managers and is designed to encourage the creation of close, long-term links between national research programmes with shared goals

2.2 IWRM-Net (Integrated Water Resource Management Network)

IWRM-NET will tackle, amongst other things, WFD implementation by examining Integrated Water Resources Management issues and identify both short term and long term research needs through a bottom up approach. 17 partners from 14 countries have agreed a shared vision for what IWRM-NET should offer by 2010:

- A privileged source of knowledge for IWRM research in Europe, in particular relation to the WFD.
- A forum for the future development and coordination of research needs, and a communications link between researchers, policy-makers and managers.
- A body that can bring together researchers and funders from different countries so that they can work on joint research activities.
- A place to exchange best practice.
- By improving the knowledge transfer amongst stakeholders in charge of IWRM, our network enables us to work on synergies between research needs and policy, and promotes interdisciplinary activities concerning IWRM across Europe.

In reviewing the current methods for research management across Europe the IWRM network aims to recommend a number of methods and processes that highlight good practice. In order to deliver IWRM one must consider much broader concepts within the spectrum of the knowledge process, including innovation, experimental design and knowledge management. The

¹ <http://cordis.europa.eu/coordination/era-net.htm>

IWRM network is looking to provide the first level of support to research programme managers in their role within the knowledge process, focussing on knowledge/research management, and will create a common level of understanding of the process of taking blue-sky research and developing the ideas into workable policies or operational guidelines that help achieve IWRM.

2.3 The Knowledge process for IWRM

The whole knowledge process runs from the initial ideas and innovation through to the implementation of those ideas into society, whether that's the public at large or an organisation that changes its working methods. This complex process covers all aspects of research management and knowledge management, which would be too much to cover in detail within this document. The main focus of the organisations involved with IWRM is research programme management which involves the setting of criteria and aims and procuring research projects to achieve the aims. Yet increasingly more programme managers and organisations are looking to ensure that the process runs beyond the mere dissemination of results. The work of research management organisations is now increasingly covering knowledge management where the results are transferred into methods and processes. In this section the report introduces the themes for research within IWRM, for example the Global Water Partnership report² states that there are various tools and mechanisms available to implement IWRM listed three headings;

- Enabling environment,
- Institutional roles,
- Management instruments.

In order to understand the management requirements, one must also understand the resource and so assessments must be made on this. Then the socio-economic climate within which the management systems will be set up are important. All these factors are relevant and must be considered when implementing IWRM.

The first question a research programme manager must ask is "do we have the knowledge base within the region or country to analyse the resource, create the tools and then implement IRWM"? If the answer is no then the design and management of a research programme must deliver the technical knowledge to the right people who will deliver IWRM. This is not a precise science and any number of mechanisms could be suitable for achieving IWRM, which may not be listed here. What is important is that there is continual cross-checking to make sure that a programme continues to consider best practice and developments in thinking but continues to strive for the goals defined by the nations understanding of IWRM.

We have more information now than we can use, and less knowledge and understanding than we need. Indeed, we seem to collect information because we have the ability to do so, but we are so busy collecting the information we haven't devised means of using it. The true measure of any society is not what it knows but what it does with what it knows.

Warren Bennis.

² Global Water Partnership (2000) *Integrated Water Resource Management*. TAC background Papers No 4

3. NORTHERN EUROPE



3.1 Finland

3.1.1 Water Resource Assessment

The greater part of Finland is located at a latitude between 60 and 70 degrees north. Finland is located in a transition zone between a continental and maritime climate and belongs mostly to the boreal zone. The Finnish landscape is mostly flat with few hills in the north and is affected by the ice ages. In southern Finland the elevation is typically less than 200 metres and in northern Finland highest elevation is less than 1,400 metres. Land uplifts vary, but with typical annual rates around 0.5—0.8 cm sea level rise is fully offset. The influence of the Baltic Sea and the Gulf Stream makes the climate favourable for the Finnish population.

Table 1 – Water resources of Finland

Environment	Water Resources	Mean total annual precipitations	500-700 mm
		Lowest annual mean - low lying NE	300 mm
		Highest annual mean – Northern Alps	1100 mm
		Annual volume of useable water <i>(precipitation and river discharges minus evaporation)</i>	100 km ³

Approximately 9% of the surface of Finland is covered by inland waters, with more than 56,000 lakes larger than 10,000 m². It is one of the most sparsely populated countries in the world. There are 74 main water systems with a catchment area larger than 200 km²; the biggest and longest river in Finland is the Kemijoki. It originates near the Russian border and flows generally southwest for about 483 km to the Gulf of Bothnia at Kemi. The river system is harnessed for hydroelectric power production and is important for salmon fishing and for transporting logs. For 1971–2000, the mean annual discharge at the Isohaara site was 566 m³/s with a minimum discharge of 67 m³/s and a maximum discharge of 4,824 m³/s. Spring floods cause erosion damage on the bank of the Kemijoki. The river has been regulated since the 1940s for hydroelectric power generation and flood protection. Before damming, the river was an important nursery area for migratory salmon and trout.¹

The total shoreline length of the lakes is 130 000 km. The total length of all rivers is estimated to be around 20 000 km.

During the period 1961-1990, the Finnish territory received a mean precipitation of 660 mm. Of this amount, 341 mm was evaporated, while 318 mm flowed into the seas or passed out over the national borders. The water storage was increased by 1 mm during this period. The mentioned value 318 mm corresponds to a mean discharge of 3400 m³/s.

In Finland the non-point source pollution from agriculture is by far the greatest single source of both nitrogen and nutrient loading. Farming accounts for about 51 % of the total nitrogen and 63 % of the phosphorus loading caused by human action. Agricultural land represents only about 8 % of the total

¹ UNECE Hands Across the water: assessment of transboundary rivers lakes and groundwaters

surface area of Finland, but in many regions in southern and south-western Finland with abundant water bodies the share of agricultural land is over 30%. This means that the loading of waters is also very strongly concentrated to these regions.

3.1.2 Socio-economic assessment

The majority of the population is concentrated in the southern parts of the country. Finland is the sixth largest country in Europe in terms of area, but the most sparsely populated country in the European Union.

Table 2– Socio-economic indicators of Finland

Socio-economics ²	Geography	Area	338,145km ²
		population	5.3 million
		Inhabitants per km ²	15.5
	Land use	Urbanisation	70%
		Water	10 %
		Forests	69%
		Arable	8 %
		Swamp	3 %
		Other	10 %
		Finance	Currency
	GDP (Billion EUR), 2006		168
Social	Life expectancy at birth (Women, Men), 2003	81.6, 75.6	
	Total labour force (000s), 2004	3 939	
	Government type	Federal Republic	
Macroeconomic trends (2006)	Size of GDP 	Gross domestic product	162.3824
		GDP per capita	30 958.8809
		Volume index of GDP per capita	117.0599
	National income per capita	Gross national income per capita	31 382.5039
Environment	Water consumption	Total gross water abstraction	2 319.2
		Per capita water abstractions	450

Source: OECD

Finland currently extracts around 0.7 million cubic metres of groundwater a day. Groundwater accounts for around 60 % of the water distributed by waterworks around the country. In sparsely populated areas most people depend on groundwater from wells or springs.

3.1.3 Legal, regulatory and management assessment

The Ministry of Agriculture and Forestry steers the Regional Environment Centres and Finnish Environment Institute in the use and management of water resources. As regards general administration these are subject to the Ministry of the Environment, which also steers them in water protection tasks. The usage of water resources is regulated in detail by Finland's water

² Source: The implementation of the EU Water Framework Directive in Austria: Status as of 2005 - Wolfgang Stalzer / Hellmut Fleckseder

legislation, coordinated by the regional environment centres and the environmental permit authorities.

In the water resources sector the Ministry of Agriculture and Forestry is responsible for

- preparation of State budget and operative and financial planning preparing the legislation
- strategic planning of the activity
- EU affairs and international cooperation
- performance guidance of Regional Environment Centres and Finnish Environment Institute

Water resources tasks of the Regional Environment Centres are

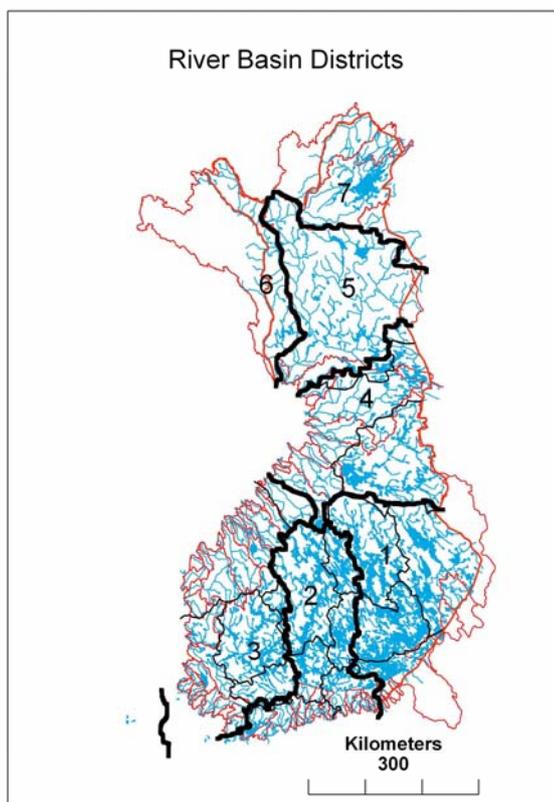
- water services
- flood prevention
- dam safety
- regulation of waters
- management and restoration of waters
- ditching operations
- support payments and advisory services

Water resources tasks of the Finnish Environment Institute are

- research and development serving the use and management of waters
- national monitoring of water resources
- expert services to the Regional Environment Centres and Ministry

Responsibility for the use and management of water resources has increasingly been transferred to regional environment centres as the scale of such operations has generally declined, with the emphasis shifting more towards restoration measures.

Figure3 – River Basin Districts in Finland



The environmental administration nevertheless continues to provide expert help, advice, training and information in order to promote sustainability in the use of water resources.

For the delivery of the Water Framework Directive, in particular the river basin planning, Finland has set up planning cooperation groups. Within these groups there must be a minimum of 1 Regional Environment Centre.

The rural development regulation also provides management opportunity for water resources, linked to the issue of agriculture and diffuse pollution of water bodies.

3.1.4 IWRM Research Management

The Ministry of the Environment is in charge of water protection and environment policies including WFD reporting to EU.

The Ministry of Agriculture and Forestry is in charge of management of water resources.

Finland's 13 regional environment centres are responsible for the planning of river basin management in their respective districts, with one regional environment centre appointed to co-ordinate the management of each of the RBDs, together with a steering group.

Finnish Environment Institute conducts Research and development projects and supports RBD's in implementation of WFD. Within the framework of UNECE working group on IWRM Finland promotes transboundary collaboration in Eastern areas.

- WFD short term priorities
- Support development and implementation of
- Program of Measures
- Ecological classification
- Monitoring programmes
- Risk assessment
- Public participation practises

TEKES is the main public funding organisation for research and development in Finland. TEKES funds mainly industrial projects as well as projects in research organisations, and especially promotes innovative, risk-intensive projects.

The Academy of Finland provides funding for high-quality scientific research, serves as an expert in science and science policy, and strengthens the position of science and research.

3.1.5 Key IWRM research programmes

Project Name	Protection of the Baltic Sea (2002-2017)
Acronym	BIREME
Project Description	The Finnish Government made a decision-in-principle on steps to be taken to protect the Baltic, i.e., Finland's programme for the protection of the Baltic Sea. The main aim is to influence the state of the waters and the marine environment in the Gulf of Finland, the Archipelago Sea, the Åland Sea, the north Baltic proper, and the Gulf of Bothnia. The aim is for this influence to come both from Finland and from countries in adjacent regions.
Start date	26.4.2002
Research Themes	The research themes of the programme are the following: <ul style="list-style-type: none"> • Analysis of change in the Baltic Sea and its drainage basin • Interactions between the land, coast, air and open sea • Social and environmental interactions in the Baltic Sea region. The projects and consortia of BIREME have been organised in six thematic sectors: <ol style="list-style-type: none"> 1. Eutrophication 2. Fish biology and Fisheries 3. Winter ecology 4. History and Governance 5. Biodiversity 6. Toxins.
Project funding	The total costs of the protection programme are estimated at 300 – 370 million euro during a 10 – 15 years' period. Additional state finance is proposed for extra actions in agriculture, for the south-western sewage works in St. Petersburg, and for the oil combating vessel in the eastern Gulf of Finland.
Dissemination method	Not applicable

Dissemination details	http://www.ymparisto.fi/default.asp?contentid=73160&lan=en
Project Name	<u>Environmental Cluster Research Programme</u>
Acronym	Not applicable
Project Description	<i>Programme is a collaborative programme between researchers, the business sector, public authorities and funding organisations. This programme aims at raising the level of environmental know-how, improving the state of the environment, and integrating environmental issues more closely into the Finnish system of innovation.</i>
Start date	<u>(The fourth phase 2006-2009)</u>
Research Themes	The theme of the fourth phase is "Ecoefficient Society" and the programme has been divided into five sectors: <ol style="list-style-type: none"> 1. Nature and natural resources 2. Communal structure and habitat 3. Production and consumption. 4. Climate change 5. New material technologies for construction of infrastructures
Project funding	Estimated 2 million euros
Dissemination method	Scientific and professional articles, project seminars etc.
Dissemination details	http://www.ymparisto.fi/default.asp?contentid=105793&lan=en

Project Name	<u>Joint research programme on water management in agriculture and forestry</u>
Acronym	Not applicable
Project Description	Agriculture, forestry and other types of land-use (e.g. drainage) often cause dramatic changes in water bodies such as nutrient loading, organic matter or flooding. The current observation and monitoring of waters does not provide enough information for water management planning. The quantitative and qualitative methods for monitoring the loading should be improved, and the utilization of data collected in the information systems of agriculture and forestry.
Start date	<u>(2006-2009)</u>
Research Themes	<ul style="list-style-type: none"> - Assessment of the aggregate impact and applicability of the objectives and measures of different policy sectors in terms of the status of waters, floods and water management planning - Development of water management measures for agriculture and forestry - Study of the ecological impacts of water loading from agriculture and forestry - Foundations for the development of the monitoring of water loading and impacts caused by agriculture and forestry - Study of the economic questions relating to water management in agriculture and forestry - Information on the benefits produced by water management measures should be collected and made comparable.
Project funding	Estimated 2.4 million euros <i>The research programme on water management is mainly financed by the Ministry of Agriculture and Forestry and the Ministry of Environment by means of uncommitted joint research funding.</i>
Dissemination method	Scientific and professional articles, project seminars etc.
Dissemination details	http://www.mmm.fi/fi/index/tutkimus/vesienhoidon_tutkimusohjelma.html

3.2 Latvia

3.2.1 Water Resource Assessment

The Daugava river is a trans-boundary river across Belarus, Latvia, the Russian Federation and Lithuania. It stretches 58,700km. In the Latvian part of the basin it runs for 20,200km which amounts to 38.38% of the river. The main point pollution sources are wastewaters, storm waters, large animal farms, waste disposal sites, contaminated sites and fish farming. Most of the phosphorus load comes from municipal wastewater treatment facilities. Municipal wastewaters also contain dangerous substances discharged from industrial facilities. Most of the diffuse pollution - nitrogen and phosphorus - comes from agriculture.³ The measured load in the Daugava is approximately 40,000 tons of total-nitrogen and 1,300 tons of total-phosphorus per year. Taking retention into consideration, about 50% of this nutrient load originates in Latvia and the rest in upstream countries. The most important human impact on the hydrological state of waters comes from land melioration, deepening and straightening of rivers and building of dams. These impacts caused changes in the hydro-morphology of the rivers and lakes in the basin. It is likely that the continuation of the present economic development in Latvia will significantly increase human impact on the basin.

The Lielupe River originates in Latvia at the confluence of two transboundary rivers: the Musa River and the Nemunelis River, also known as the Memele. It runs for 17,600km of which 49% is within Latvia. The Musa has its source in the Tyrelis bog (Lithuania) and the Memele River in the Aukstaitija heights west of the city of Daugavpils (Latvia). The Lielupe River ends in the Baltic Sea. It has a pronounced lowland character. Latvia presently has 6 sites designated as Wetlands of International Importance, with a surface area of 149,158 hectares

Environment Water Resources	Mean total annual precipitations	700 mm
	Availability	6.31 km ³
	<u>Freshwater pollution</u>	0.8 tons/cubic km
	<u>Phosphorus concentration</u>	0.1 mls/litre
	Annual volume of useable water (precipitation and river discharges minus evaporation)	490 mm
	Length of watercourses	37950 km

Table 3. Water Resources of Latvia

3.2.2 Socio-Economic Assessment

Latvia's economy experienced average GDP growth of more than 7.0% over the past several years. In 2006 it reached 10.2% real GDP growth. The majority of companies, banks, and real estate have been privatized, although the state still holds sizable stakes in a few large enterprises. Latvia officially joined the World Trade Organization in February 1999. EU membership, a top

³ Based on information from the report of the "Daugavas Project", a bilateral Latvian - Swedish project, "Daugava river basin district management plan", 2003.

foreign policy goal, came in May 2004. The current account deficit - more than 15% of GDP in 2006 - and inflation remain major concerns⁴.

Since the year 2000 Latvia has had one of the highest (GDP) growth rates in Europe. In 2006, annual GDP growth was 11.9% and inflation was 6.2%. Unemployment was 8.5% — almost unchanged compared to the previous two years. However, it has recently dropped to 6.1%, partly due to active economic migration, mostly to the Republic of Ireland and United Kingdom. Privatisation has been mostly completed, except for some of the large state-owned utilities. Latvia is a member of the World Trade Organization (1999) and the European Union (2004).

Latvia's environment has benefited from a shift to service industries after the country regained independence; the main environmental priorities are improvement of drinking water quality and sewage system, household, and hazardous waste management, as well as reduction of air pollution.

The government introduced special program to reduce inflation and remain high growth rates recently. The main points of the plan are⁵:

- To create a non-deficit country budget for the current 2007 year and a budget with a surplus for 2008 and beyond;
- to tax any transaction concerning real estate that has been in a person's possession less than three years;
- to increase control of credit;
- to increase energy effectiveness in homes and business to guard against possible rises in energy costs, and
- to increase work productivity and stimulate competition in business.

Table 4. Socio-economic resources: Latvia

Socio-economics Geography Land use Social	Area	64 589 km ²	
	Population	2.3 mln	
	Inhabitants per km ² (2006)	35,5	
	Urbanisation	650 km ²	
	Pasture	6368 km ²	
	Arable	12051 km ²	
	Forests	29181 km ²	
	Currency	Lats	
	Life expectancy at birth (Women, Men), 2006	76,8 (women) 65,9 (men)	
	Total labour force , 2006	1 477 000	
	Government type	Parliamentary democracy	
	Size of GDP	Gross domestic product, 2006	11 264 695 LVL
		GDP per capita, 2006	4 923 LVL
Volume index of GDP per capita, 2006		111.9 as % of previous year	
National income per capita	Gross national income 2006	10 945.2 mln LVL	
Water consumption	Total gross water abstractions (2006)	237mln m ³	
	Per capita water abstractions		

Data source: Central Statistical Bureau of Latvia. Statistical databases
<http://www.csb.gov.lv/csp/content/?lng=en&cat=355>

⁴ Source: CIA World Fact Book

⁵ Source: Wikipedia

3.2.3 Legal, regulatory and management Assessment

In 2001, Latvia closed the EU accession negotiation chapter on environment committing to full enforcement of EU environmental directives by 2010.

3.2.4 Key IWRM research programmes

Research needed for implementation of WFD and development of IWRM is going on in close cooperation with international research – FP 5, 6 projects (STAR, SWIFT, Eurolimpacs etc), INTERREG and Life projects.

Major activities are coordinated within:

- National research program “Climate change and waters” – funded directly by Ministry of Education and Science and managed by LCS
- Cooperation projects – Long-term ecological observations" and modeling in waterbodies”
- 22 research projects
- 8 monitoring projects
- EU twinning and other pilot projects
- Projects funded by agencies

Programme Name	Basic and Applied Research Projects Programme
Acronym	
Project Description	The goal of the programme has been to strengthen Latvian research potential. In line with this aim grants are primarily and in greater volumes allocated to applications by high-performance research groups and groups involving young scientists, as well as post-doctor fellows. The main beneficiaries of the programme are research groups at public research organisations. The programme was introduced by the Latvian Council of Science .
Start date	1994
Research themes	<p>The programme does not have formally defined sub-programmes. At the same time it is possible to identify at least 14 of them corresponding to the number of branch expert commissions of the Latvian Council of Science. Each of the 14 sub-programmes receives a constant (percental) share of the total funding which has remained unchanged since 1991. The provided data reflect both the sub-programme structure and the distribution of the respective funding:</p> <ul style="list-style-type: none"> • Computer Science (5.57%) • Mechanics, Mechanical and Power Engineering (7.43%) • Physics, Mathematics and Astronomy (13.289%) • Chemistry (10.179%) • Scientific Principles of Technology (4.651%) • Biology, Environmental and Earth Sciences (9.719%) • Molecular Biology, Virology, Microbiology and Biotechnology (7.207%) • Medical Sciences (10.355%) • Agricultural Sciences (10.874%) • History (Including History of Culture) (3.026%) • Linguistics, Literature, Folklore and Art Studies (3.926%) • Philosophy, Sociology, Psychology and Pedagogy (6.125%) • Economics and Law (5.842%) • Forest Sciences (1.807%) <p>On 20 June 2006 the Cabinet of Ministers defined the following 5 branch expert commissions of the Latvian Council of Science: natural sciences and mathematics; engineering and computer science; biology and medical science; agriculture, environmental and earth and forest sciences; humanities and social sciences. The current structure of 5 branch expert commissions is similar to those present in many other countries</p>
Project funding	Biology, Environmental and Earth Sciences (9.719%)
End Date	No end date on the programme forseen

Programme Name	State research programme "Environmental research"
Acronym	
Project Description	The generic goal of the Research Programme is to assess short-, medium-, and long-term impact of climate change on the environment and ecosystems of the inner waters of Latvia and the Baltic Sea; create a scientific basis for adaptation of environmental and sectoral policies of Latvia to climate change. Regional climate models show that the climate change manifestations in the Baltic region will be more tangible in comparison to the global average. Global climate change on a local and regional level can manifest itself not only as climate warming but can be related to an increasing frequency of climatic extremes or can even be characterized by a reverse trend of the global processes. Scientifically grounded actions for reduction and adaptation of the negative effects of climate change have to be developed.
Start date	2006
Research themes	The key priorities with this research programme are the following: <ul style="list-style-type: none"> - Climate change impact on runoff, nutrient flows, and regime of the Baltic Sea - Climate change impact on nutrient turnover in the drainage - Climate change impact on freshwater ecosystems and biological diversity - Coastal dynamics - Bio-geo-chemical processes and primary production in the Baltic Sea - Climate change impact on ecosystems and biological diversity of the Baltic Sea - Adaptation of environmental and sectoral policy to the climate change - Impact of climate change on runoff extremes and areas influenced by floods and droughts
Project funding	€2.3 million
End Date	2009
Agency administering	The administering agency is the Latvian Council of Science (Latvijas Zinatnes padome http://www.lzp.lv)
Funding Agency	The funding agency is the Ministry of Education and Science (Izglitiba un zinatnes ministrija http://www.izm.gov.lv)

3.3 Sweden - IWRM Context

3.3.1 Water resources assessment

Sweden is the third largest country in [Western Europe](#). Sweden has a low [population density](#) except in its [metropolitan areas](#); of the population lives in urban areas, which take up only 1.3% of the total land area.^[1]

Sweden has an abundance of surface watercourses and bodies of widely varying kinds. These include crystal-clear oligotrophic mountain rivers and lakes, the turbid waters of forest lakes, stained brown by humus and eutrophic watercourses crossing lowland areas and home to a rich variety of plant and animal life. There are some 60,000 kilometres of running water, ie, brooks, streams and rivers, as well as some 90,000 lakes having an area of at least 1 hectare.

Together Sweden's lakes cover an area of almost 42,000 km², ie, approximately 9 per cent of the country's total area. The majority of water bodies are very small, although some are very extensive. Lakes Vänern and Vättern are among the largest lakes in Europe and, together with the two next largest lakes (Mälaren and Hjälmaren), they account for no less than 24 per cent of the total lake area in Sweden. [source: Naturvardsverket]

Table 5. Water Resources of Sweden.

Environment - Internal Renewable Water Resources (IRWR), 1977-2001.	Total renewable water resource km ³	174
	Surface water produced internally km ³	170
	Groundwater Recharge km ³	20
	Overlap (shared by groundwater and surface water) km ³	19
	Total Internal Renewable Water Resources (surface water + groundwater - overlap)	171
	Per capita IRWR, 2001 (cubic meters)	19381
Annual River Flows:	From other countries (cubic km)	12
	To other countries (cubic km)	178

3.3.2 Socio-economic assessment

[Timber](#), [hydropower](#), and [iron ore](#) constitute the resource base of an [economy](#) heavily oriented toward [foreign trade](#). Sweden's engineering sector accounts for 50% of output and exports. Telecommunications, the automotive industry and the pharmaceutical industries are also of great importance. [Agriculture](#) accounts for 2% of [GDP](#) and employment.

Table 6. Socio-economic resources of Sweden.

Socio-economics Geography Land use Social	Area	449,964 km ²
	Population	9,031,088
	Inhabitants per km ²	20
	Urbanisation	84%
	Permanent crops	0.01%
	Arable	5.93%

	Other	94.06%
	Currency	Krona
	Life expectancy at birth (Women, Men), 2003	83, 78.39
	Total labour force (000s), 2004	4,586
	Government type	Constitutional monarchy
Size of GDP	Gross domestic product (OECD)	289.9628
	GDP per capita (OECD)	32 111.0519
	Volume index of GDP per capita (OECD)	120.5585
Water consumption	Total gross water abstractions	2 676
	Per capita water abstractions	300
	Total abstractions (cubic km) 1991 – FAO	3
	abstractions per capita (cubic m) 1991 – FAO	340
	Abstractions as a percentage of Actual - Renewable Water Resources1991 – FAO	1.7 %
	abstractions by Sector (as a percent of total) Agriculture1991 – FAO	9 %
	Industry1991 – FAO	55 %
	Domestic1991 – FAO	36 %

3.3.3 Legal, regulatory and management assessment

Swedish Water Act 1983

The Ministry of the Environment is responsible for the resource conservation and SEPA is the enforcement agency. The Ministry of Agriculture supervises the quality of drinking water and the Water and Waste Water Association coordinates the municipal authorities in the delivery of water services.

3.3.4 Key IWRM research Programmes

Programme Name	Swedish Water Management Research Programme
Acronym	VASTRA
Project Description	first phase (1997-2000) was evaluated both from a scientific and a user perspective in 1999. as result social sciences increased. Prog. For phase2 evaluated by MISTRA board and granted funding in 2001. priorities set out in communication with stakeholders (VASTRA Committee)programme is a result of a process that followed a call for tenders by MISTRA in 1995. prog.1 (96) evaluated by scientific board & granted funding
Start date	2001
Research themes	<ul style="list-style-type: none"> - IWRM, catchment scale, - stakeholder participation, - conflict resolution, - tradable permits, - nutrient transport, - eutrophication control, - integrated tools
Project funding	
End Date	
Agency administering	
Funding Agency	
Programme Name	Marine Research on Eutrophication - a Scientific Base for Cost-Effective Measures for the Baltic Sea
Acronym	MARE

Project Description	MARE is aimed at decision-makers working on Baltic Sea environmental issues. In the programme, a user-friendly decision support system (Nest) is being developed. The system demonstrates what could be a cost-effective distribution of the measures needed in order to achieve a desired environmental quality in the Baltic Sea. By changing various parameters in the system, the user can create different scenarios of possible options in different parts of the Baltic Sea region.
Start date	1999
Research themes	<p>Development and maintenance of the decision support system (Nest) The aim is to achieve a well-documented, user-friendly and transparent system in which underlying data are visible and identifiable and can be modified where necessary.</p> <p>Ecological targets - propose ecological indicators, such as reduced algal blooms, a rich and diverse benthic fauna, and interactions between eutrophication, fishing and population trends for cod, herring and sprat. These indicators should then be related to reductions in nutrient inputs and to the costs of attaining the indicators.</p> <p>Marine models As concentrations of nutrients in coastal and open sea areas are determined not only by the scale of inputs, but also by the way nutrients are transferred between different basins and by the various biogeochemical transformations they undergo, existing physical/biogeochemical model will be further developed and time dynamics will be incorporated into it. Models for estimating water exchange between open sea areas and the coastal zone, in an attempt to make Nest more useful in the context of implementing the EC Water Framework Directive, will be developed</p> <p>Drainage basin model linked to cost-effective measures Since most abatement measures are taken within a drainage basin, dynamic, large-scale drainage basin models will be developed. Economists and natural scientists will work together to further develop the large-scale drainage basin model used in Nest.</p>
Project funding	
End Date	2006
Agency administering Funding Agency	Director: Swedish Environment Protection Agency Scientific coordinator: Stockholm University Swedish Foundation for Strategic Environmental Research

Project Name	Mitigating the environmental impact of mining waste
Acronym	MiMi
Project Description	The aim of the MiMi programme is to survey the mining waste processes that may be affected over a long period of time and, based on the knowledge acquired, develop new and improved treatment methods. The idea is that methods should be available to assess any possible environmental impact even in conjunction with prospecting for a new mine. In this way, it will be possible to implement measures from the outset to minimise the environmental impact of mining operations, based on the knowledge of the mineralogical and chemical composition of the ore and the surrounding rock.
Start date	1997
Research themes	<p>Summary of MiMi Results</p> <ul style="list-style-type: none"> - The MiMi results confirm that the primary objective for remediation of potentially acid generating mine tailings is to restrict the oxygen intrusion. - For soil covers, there is significant potential for the primary acidity to be neutralised within the tailings. - For soil cover the metals copper, lead and cadmium can often be retained in the tailings whereas iron, zinc and arsenic are not. - The dissolved ferrous iron constitutes a latent acidity which is expressed first when the drainage is further oxidised outside the tailings deposit. - The ferrous iron in the effluent from the soil covered deposit will eventually oxidise and form secondary iron(III) precipitates (SIPs) that offer a significant adsorption capacity for trace elements, in particular arsenic. - For water covers neither the primary acidity nor the released metals are attenuated in the tailings. - The acidity load, the mixing ratio between drainage and surface runoff and the natural alkalinity of the surface runoff are site specific parameters that need consideration. - The capacity of downstream wetlands as a trap for trace elements has been found to be low in the cold Swedish climate. The main reasons being channelled flow and frozen soils during peak-flow in spring. - A performance assessment methodology has been adapted and tested for evaluation of the long-term function of tailings deposits. The methodology has been found effective and suitable for assessment of the most important processes governing the complex interactions in disposed sulphidic mine tailings. - The general methodology and the presented base case evaluations can be used as a guideline, example and reference in future studies of other objects. - The pros and cons of soil cover and water cover techniques have been studied and compared. - The conclusion drawn is that both methods can be applicable and effective. The site specific conditions must be considered when deciding the most appropriate method at

Project funding	a particular site.
	SEK 78 million
End Date	2004
Agency administering	<p>Programme Director</p> <p>Lars Olof Höglund Kemakta Konsult AB P.O. Box 12 655 SE-112 93 Stockholm Sweden Phone +46- 8- 617 67 17 Mobile +46-70-669 67 17 Fax +46- 8- 652 16 07 E-mail loh@kemakta.se</p>
Funding Agency	Swedish Foundation for Strategic Environmental Research

Project Name	Plasma-enhanced reaction systems for environment applications
Acronym	PERSEA
Project Description	The combustion of fossil fuels and household waste as well as bio-fuels causes emissions of hazardous substances, especially nitrogen oxides, dioxins, sulphur dioxide and volatile hydrocarbons. There is a great need for more effective measures to control exhaust emissions from different types of stationary plants and vehicles. The aim of the programme is to develop plasma technology for cost-effective exhaust emission control. The programme is primarily focused on the treatment of nitrogen oxides and volatile hydrocarbons and the aim is for the technology to be used to reduce several pollutants at the same time. Using a hollow cathode with a special geometry and low energy consumption, extremely rapid reactions may be achieved.
Start date	2000
Research themes	<p>The PERSEA research supported by the MISTRA Foundation is aimed to applications of a new cold plasma source, developed recently by the Plasma Group at the Ångström Laboratory in Uppsala, for gas cleaning and transformation. The source, Fused Hollow Cathode (FHC) can generate a cold plasma at atmospheric pressure at very low power consumption.</p> <p>Due to very efficient interactions of electrons with the gas passing the cathodes the system can be used in different gas cleaning treatments. Moreover, the treated gas can be utilized in subsequent treatments of surfaces, like cleaning, disinfection, surface activations, etc. All these properties open a new branch in environmental research and applications of the cold atmospheric plasma.</p>
Project funding	SEK 35,5 million
End Date	2009
Agency administering	Ångström Laboratory, Uppsala University
Funding Agency	Swedish Foundation for Strategic Environmental Research

Project Name	Remote sensing for the environment
Acronym	RESE
Project Description	Researchers within RESE are trying to ensure that information from satellites will soon be put to practical everyday use in environmental monitoring and assessment. Remote sensing with the help of satellites is a cost-effective way of collecting environmental data on phenomena that can vary considerably both in time and space. It can provide valuable guidance on how the environment is affected and is under heavy pressure from agriculture and forestry, road building, urban sprawl or acidification, as well as tourism and recreation. Even when it comes to discussions on the environmental impact of climate change and global warming, satellite data represents an important source of information.
Start date	1996
Research themes	<p>Projects within RESE, phase 1 (research)</p> <ul style="list-style-type: none"> • Vegetation change – analysis of spectral, temporal and spatial characteristics of Swedish vegetation types and elements and their changes • Monitoring of forest ecosystems • Sustainable landscapes – future satellite monitoring of landscape change • Identification and monitoring of herbivore habitat resources in mountain regions • Method for detection of changes in aquatic ecosystems and monitoring of algal blooms

	<ul style="list-style-type: none"> • Sensor, atmosphere and objects – characterisation and correction methods • Image classification and interactive analysis • Sampling procedures and models for variation in space and time <p>Examples of projects within RESE, phase 2 (implementation):</p> <ul style="list-style-type: none"> • Evaluation of Environmental Monitoring Strategies • Environmental monitoring in Gävleborg and Dalarna counties • Monitoring change in mountainous Dry-heath vegetation at a regional scale using multitemporal Landsat TM data • Detection of vegetation degradation on Swedish mountainous heaths at an early stage by image interpretation • Distribution of deciduous stands in villages located in coniferous forest landscapes in Sweden • Two-dimensional gap analysis: a tool for efficient conservation planning and biodiversity policy implementation • Forest reflectance modelling: theoretical aspects and applications • Countrywide estimates of forest variables using satellite data and field data from the National Forest Inventory (kNN) • Modelling habitat suitability for moose in coastal northern Sweden: empirical vs. process-oriented approaches • Conflict resolution by participatory management: Remote Sensing and GIS as tools for communicating and land-use needs for reindeer herding in northern Sweden • Effective field sampling for predicting the spatial distribution of reindeer (Rangifer tarandus) with help of the Gibbs sampler • Quantifying spatial patterns of landscapes • Assessing Secchi and photic zone depth in the Baltic sea from satellite data • Can coral reefs be monitored from space? • Assessing village authenticity with satellite images; a method to identify intact cultural landscapes in Europe <p>RESE Miljömål, phase 3 in RESE (products and services) RESE Miljömål is the last phase of the RESE programme. It tries to take established (already researched and partly implemented) methods all the way to usable products or services. Examples of RESE Miljömål projects include:</p> <ul style="list-style-type: none"> • Remote sensing and GIS in support of planning for the water framework directive (in order to get “good ecological status” for all waters in 15 years) • Forests of interest to conservation biology in a Swedish county, Örebro as example (using remote sensing and GIS) • A fusion of indicators for environmental quality objectives in the Swedish mountains • National environmental monitoring of vegetation in alpine areas • Baltic Algae Watch System (BAWS), for monitoring of algal blooms • An environmental monitoring programme for Dalarna and Gävleborg counties, with emphasis on forest and protected areas • Regional analysis for forest conservation biology planning on a landscape and regional level • Generalisation of “kNN Sweden”, a dataset with nation-wide coverage of forest composition • A test of mapping humic (brown-water) lakes using Landsat data • A national workshop on remote sensing for the environment, with endusers, producers and scientists together • “Enforma Natur”, a system for monitoring national parks and nature reserves, primary for forests, agricultural land and wetland • Planning of thinning and cutting operations in forest management supported by remote sensing
Project funding	SEK 85 million
End Date	2005
Agency administering Funding Agency	Main contractor - Metria Environmental Analysis, National Land Survey of Sweden
	Swedish Foundation for Strategic Environmental Research

Project Name	Sustainable coastal zone management
Acronym	SUCOZOMA
Project Description	To bring about a modified use of coastal resources and to achieve sustainable resource use, with regard to both the boundaries of the ecosystem and the needs of the coastal population. To carry on research in co-operation with stakeholders, fishery (coastal and recreational as well as those involved in distribution and trade), coastal municipalities and central, regional and local authorities responsible for

	fisheries issues, the coastal environment and coastal management.
Start date	1997
Research themes	<p>SUCOZOMA has included 55 scientists and 25 doctoral candidates of which 18 have defended their doctor's thesis before the end of the programme. The programme has delivered approximately 350 publications, articles and reports, within natural science, social science and jurisprudence. Several publications are interdisciplinary syntheses. The SUCOZOMA research has shown in practice that:</p> <ul style="list-style-type: none"> - coastal fisheries can improve with the help of selective fishing methods and tools and that management methods can restore spawning grounds for fish species that have previously not been considered as interesting from a commercial point of view - the effects of eutrophication can be reduced by mussel farming and new methods in the sewage treatment processes - better knowledge of the political, social and economic conditions in the coastal zone can renew and democratize the management and planning of a sustainable use of the coastal resources
Project funding	SEK 80 million
End Date	2004
Agency administering Funding Agency	<p>Main contractor – Goteborg University</p> <p>Swedish Foundation for Strategic Environmental Research</p>

Project Name	Sustainable urban water management
Acronym	
Project Description	<p>The water supply and sewage treatment systems of Swedish towns and cities provide drinking water in sufficient amounts, dispose of sewage in a hygienically acceptable manner, and take care of storm water to prevent flooding. They fulfil these three basic requirements without damaging the environment, but they do not satisfy the requirement for being ecologically sustainable. Future water supply and sewage treatment systems must be able to recirculate plant nutrients and function to a greater extent with the help of the active participation of the users (the general public).</p> <p>The water and wastewater systems in Sweden have, during the last decade, been questioned from the point of view of sustainability. New systems, often comprising local initiatives and source separating technology, have been developed and are running on a small scale as alternatives or complements to the central systems. It is essential to identify the future possibilities and limitations of different systems. In the light of large annual investments, it is also necessary to develop guidelines for future systems. Will the sustainable water and wastewater systems of the future be improved versions of what exists today, or will there be some radical changes?</p>
Start date	1998
Research themes	<p>Most of the work in the programme was undertaken in Doctoral projects :</p> <p>Socio-culture and economy:</p> <ul style="list-style-type: none"> - Sustainable households or overworked residents? - Economics of sustainable urban water management. <p>Hygiene:</p> <ul style="list-style-type: none"> - Faecal contamination and transmission routes of pathogens. - Evaluation of pathogenic microbial reduction of compost and other organic waste products. <p>Risk assessments:</p> <ul style="list-style-type: none"> - Microbial risk assessment for sustainable water systems. - Innovative information systems. <p>Reuse of rest products:</p> <ul style="list-style-type: none"> - Distribution of some essential substances in reuse of wastewater nutrients. - Influence of sewage fertiliser products on sustainability of farming. <p>Drinking water:</p> <ul style="list-style-type: none"> - Drinking water treatment methods. - Biofilms, and biofilms as microbiological barriers. <p>Storm water:</p> <ul style="list-style-type: none"> - Keeping stormwater pollution apart from the biological cycle. - Beneficial use of stormwater. <p>Wastewater:</p> <ul style="list-style-type: none"> - Product recovery by use of selective sludge fractionation. - Integrated product recovery and wastewater treatment.
Project funding	SEK 32 million
End Date	2006

Agency administering	Main contractor: Chalmers University of Technology, CTH
Funding Agency	Swedish Foundation for Strategic Environmental Research
Website	http://www.urbanwater.org/dyndefault.asp?p=2413

Project Name	Swedish Water Development
Acronym	VA FORSK
Project Description	Swedish Water Development is the Municipalities own research and development programme on Water Supply and Sanitation. The programme is directly financed by Swedish Municipalities, a unique way of using state money. The charge for Water Supply and Sanitation in Sweden is 1.16 SEK per citizen and year.
Start date	1990
Research themes	Focusing on applied research, the main themes are: <ul style="list-style-type: none"> - Drinking water - Main system _ Sewage - Economy and organisation
Project funding	
End Date	
Agency administering	
Funding Agency	The research council of the Swedish Water and Wastewater Association

4 EASTERN EUROPE



The Danube river basin covers nineteen countries with a total area of 801,463 km², but not all of them will be considered here. It is recommended that you read the UNECE document listed in the bibliography for a more detailed assessment of the basin. In this document we consider those countries that are signatories or observers to IWRM-net i.e. Austria, Germany, Hungary and Romania.

Within the Danube basin there are a number of sub-basins that are now included in the Danube River basin district for the purposes of the WFD. The confluence of two small rivers – the Brigach and the Breg – at Donaueschingen (Germany) is considered to be the beginning of the Danube.

The long-term average discharge of the Danube River is about 6,550 m³/s (207 km³/a)¹. The annual discharge in dry years is 4,600 m³/s (95 % probability, one-in-20 dry years) and in wet years 8,820 m³/s (5 % probability, one in 20 wet years)²

4.1 Austria

4.1.1 Water Resources Assessment

The Austrian federal territory is located in three international river catchment areas with about 96% of the area located in the catchment area of the Danube that empties into the Black Sea, about 3% empty via the Rhine to the North Sea and approx. 1% via the Elbe into the Baltic Sea. From the international perspective, Austria is rich in water resources

Table 7. Water resources of Austria.

Environment	Water Resources		
		Mean total annual precipitations	1170mm
		Lowest annual mean - low lying NE	500mm
		Highest annual mean – Northern Alps	2500mm
		Annual volume of useable water (precipitation and river discharges minus evaporation)	84 billion m ³

Groundwater makes up approximately one-third of the annual volume of useable water and with 99 % of the Austrian drinking water originating from groundwater this makes its protection – along with the protection of ecological integrity and the prevention of pollution of surface waters – a key consideration in water protection.

Every three years a report on the status of the protection of waters has to be submitted to the National Council³. In the “Waters Protection Report” the pressures on water bodies are subdivided according to three aspects:

- Pollution from point and diffuse sources.

¹ Danube Basin Analysis (WFD Roof Report 2004).

² Danube Pollution Reduction Programme – Transboundary Analysis Report. International Commission for the Protection of the Danube River, June 1999

³ The **National Council** ([German: Nationalrat](#)) is one of the two houses of the [Federal Assembly of Austria](#), the [bicameral federal parliament](#) of the [Federal Republic of Austria](#). According to the [constitution](#), the National Council and the complementary [Federal Council](#) are peers

- Hydraulic installations liable to cause changes in the structure of water bodies, the connection to groundwater bodies and the interconnection with the surrounding area.
- Other sources of pollution.

According to the 2002 Waters Protection Report the water quality of Austria's water bodies was satisfactory. The trend in the biological water quality of Austria's flowing waters is positive: the percentage of river stretches classified as class II or better with regard to biodegradable substances increased from 81% to 87% between 1998 and 2001. This can be attributed to the fact that over 86% of the population is connected to public wastewater treatment plants in which the wastewater undergoes at least biological treatment; 90% of the sewage solids even undergo a further nutrient elimination process. In light of Austria's population distribution (predominance of low-density settlements), the maximum level of connection to central wastewater treatment plants has been attained. The remaining wastewaters flow into decentralized facilities (cesspits, home wastewater treatment units).

4.1.2 Socio-Economic Assessment

Table 8. Socio-economic resources of Austria

Socio-economics ⁴	Geography	Area	83,858 km ²
		Inhabitants per km ²	95
		Urbanisation	67%
	Land use	Mountainous	62%
		Pasture	25%
		Arable	17%
		Forests	47%
	Finance	Currency	Euro
		GDP (Billion USD), 2004	292.3
	Social	Life expectancy at birth (Women, Men), 2003	81.6, 75.6
		Total labour force (000s), 2004	3 939
		Government type	Federal Republic

[Source: OECD statistics]

The urbanisation level is 67% - a low range for Europe. Its GDP of ~ €180 billion or €27000 per inhabitant is above the European average. Services followed by industry/trade furnish the main incomes.

The **economy** of the **Republic of Austria** may be characterised as a social market economy similar in structure with Germany's. The country has a very high standard of living in which the government has played an important role in its

⁴ Source: The implementation of the EU Water Framework Directive in Austria: Status as of 2005 - Wolfgang Stalzer / Hellmut Fleckseder

citizen's lives ever since 1945. Vienna was ranked the 5th richest NUTS-2⁵ region within Europe with GDP reaching € 38.632 per capita. Growth has been steady in recent years 2002-2006 pending between 1 and 3.3 %. Because of its position in central Europe it has gained significance as a gateway to the new EU member states.

With growth gathering pace slowly, reaching 2.25% in 2007, unemployment will remain high by historic standards. The impact of oil prices on inflation will fade by 2007. The government deficit is projected to decline only modestly by 2007. However, further substantial reductions in government spending will be necessary to lower the relatively high level of government debt in relation to GDP significantly, and make more room for future increases in ageing-related spending.

Table 8 continued. Socio-economic resources of Austria

Indicators		% change unless otherwise indicated		
		2005	2006	2007
GDP growth		1.8	2.1	2.3
Household savings ratio		8.7	8.8	8.3
Consumer price index		2.2	1.8	1.4
Short-term interest rate (%)		2.2	2.2	2.9
Unemployment rate (%)		5.8	5.8	5.7
General government financial balance (% GDP)		-2.0	-2.0	-1.5
Current account balance (% GDP)		-0.4	-0.1	0.3
Environment	Water consumption 	Total gross water abstractions		3 815.55
		Per capita water abstractions		470

Source: OECD

Some 6,000 central water supply systems serve in total approximately 90 % of the population with drinking water. Current daily per capita water consumption is about 135 litres. According to the statistics of the ÖVGW (Austrian Association for Gas and Water) the average price of household water is 1 % per cubic metre. Approx. one million Austrians are not hooked up to the public water supply, meaning they have a household well which is partly used for drinking water. Such areas are under the responsibility of the well owner rather than of the public authorities. Periodic inspections (water quality, structural condition of the well, etc.) are also highly recommendable for private wells, particularly when they are used for drinking water.

Agriculture bears a strong responsibility for our water reserves, through the practice of good land management and minimal use of potential water pollutants. Facilities such as the water protection consulting centre (Wasserschutzberatung) in Upper Austria help farmers to become water-friendly in their farming methods.

⁵ The **Nomenclature of Territorial Units for Statistics (NUTS)** is a [geocode standard](#) for referencing the administrative divisions of [countries](#) for statistical purposes.

4.1.3 Legal, institutional and management assessment

Austria is a Federal Republic formed by 9 Länder (Provinces). There is a single Water Act valid all over with the provinces mainly charged with its implementation. The obligation to keep domestic waters clean and to protect them is laid down in the Austrian Water Rights Act (Österreichisches Wasserrechtsgesetz). According to this Act the quality of groundwater and spring water must be so high that it can be used as drinking water. This Act falls within the competence of the Federal Ministry of Agriculture, Forestry, Environment and Water Management (Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft) which is also responsible for the application of pesticides and fertilizers. As soon as groundwater is withdrawn for the purpose of drinking water the competence rests with the Federal Ministry of Social Security, Generations and Consumer Protection (Bundesministerium für soziale Sicherheit, Generationen und Konsumentenschutz).

Hydrologically allocated planning units are set up within Austria

- Towards the River Danube Basin: 6 planning units
- Towards the River Elbe and River Rhine Basins: 1 planning unit each
- Co-ordination in river basin districts: bilaterally for smaller-scale tasks
- In basin-wide bodies (e.g. ICPDR⁶) for multi-lateral and basin-wide issues

In order to cope with the new requirements for ecologically oriented planning in flood protection combined with protection of the aquatic habitat, the Federal Water Engineering Administration in the Ministry of Life has developed the "Stream Care Scheme" as a major planning tool for flood protection.

4.1.4 Key IWRM research programmes

Project Name	Integrated Flood Risk Management Implementation
Acronym	Flood Risk 2
Project Description	Flood Risk 1 - was from 2003-2005. Cause and Effect Analysis based on 2002 event data, to develop lessons learnt and implementation strategies. Next stage is flood risk management modelled on basins e.g. Danube. This analysis marked the next steps in creating basic provisions for strategic decisions of integrated flood management. (sub-projects in fields such as meteorology, hydrology, geomorphology, natural disasters, economic aspects, the law, spatial planning and disaster protection). FloodRiskII goes towards the implementation of an integrated flood risk management with model river catchments (e.g. Danube and its alpine tributaries) in Austria FloodRiskII (Implementation strategies for an integrated flood risk management in Austria)
Start date	01/01/2005
Project funding	
End Date	01/01/2007
Publication	FloodRisk, Federal Environmental Agency (UBA), 2003-2007, Prof. Dr. Helmut Habersack
Research Management Process	The priorities of research programme obtained through consultation process with stakeholders including synergies and interfaces between fields of interest (e.g. meteorology and hydrology). Proposals evaluated by steering comm. (scientific board & Div heads)
Agency administering	Federal Environment Agency Austria

⁶ International Commission for the Protection of the Danube.

Funding Agency	Federal Ministry of Agriculture, Forestry, Environment and Water Management.
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Project Name	Provision for Nature and Society
Acronym	ProVISION
Project Description	<p>proVISION pursues the following objectives:</p> <ul style="list-style-type: none"> - to generate new knowledge and know-how that serves the provision for nature and society - to enhance the international presence and reputation of Austrian environmental research - to qualify young researchers in environmental research - to implement Gender Mainstreaming in environmental research - to enable the exchange and cooperation between science and society in the field of environmental research <p>proVISION is part of the Austrian Initiative for Research for Sustainable Development (FORNE) launched by the Austrian Council for Research and Technology and those federal ministries funding relevant research and development. It provides the scientific basis for the implementation of the Austrian Strategy for Sustainable Development, together with the other main research programmes in the FORNE Initiative</p>
Start date	2004
Project funding	€2.1m yr 1, overall budget not available
End Date	2013
Research Themes	<p>The main theme of proVISION is sustainable development with a special focus on climate change, global change and spatial development. Research activities aim at understanding and solving the main challenges in the provision for nature and society. The research issues are structured along 7 key questions:</p> <ol style="list-style-type: none"> 1. Risk, uncertainty and vulnerability: How can we deal with in a provident way with the vulnerability of human beings and nature? Despite risks and insecurity, how can we deal responsibly with global environmental and climate change and spatial development? How can we develop socially, culturally and economically and simultaneously achieve distributive justice and preserve the basis of life's existence. 2. Sustainable living: How can we agree on standards for the quality of life that take into account the dimensions of global change and that correspond to the goals of sustainable development? 3. Integrated welfare: What are the future costs of environmentally responsible actions and who bears them? How can we describe, measure and assess prosperity that meets the principles of sustainable development? 4. Environmental balance: What services do ecosystems provide? How much wilderness does Austria need? How can we balance society and the environment? 5. Adaptable space: What kinds and levels of use, stress and interference can space bear? What kind of spatial development and land-use are desirable and adequate for the future? 6. Global responsibility: How can Austria meet its international obligations with respect to sustainable development? How can Austria contribute to the advancement and implementation of sustainable development in the international context? 7. Sustainability mediation: What kind of science culture does a provident society need? Which type of language can support the dialogue?
Dissemination method	scientific, stakeholders and collaboration
Dissemination details	Joint call with Germany, part of FORNE, (Objective of FORNE-Initiative is the definition and further development of a common set of future goals for Austrian sustainability research and the strategic coordination of the various research programmes.)

Evaluation	Common assessment framework, for monitoring quality within the programme, additionally analyzes whole programme using knowledge management tools. All feed back to FORNE initiative.
Research Management Process	Priorities are defined in the work programme (involving scientific community). The research priorities within a call are defined by the selection of sub-tasks of work programme. Only a few of all the sub-tasks are opened within a call.
Agency administering	Austrian Science Funds FWF on behalf of the BMWF
Funding Agency	Austrian Science Funds FWF on behalf of the BMWF

Project Name	Start project Climate Protection, Climate Change
Acronym	StartClim
Project Description	StartClim is extended on a year-to-year basis, with different scientific foci (2003 extreme weather events and their impacts on Austria, 2004 heat waves and drought, 2005 and 2006 health impacts and impacts on Austria's most vulnerable economies e.g. tourism)
Start date	01/01/2003
Project funding	
End date	
Research themes	flood analysis as basis for further developments
Dissemination method	stakeholders, scientific community
Dissemination details	www.umweltbundesamt.at/startclim/ www.austroclim.at/startclim
Publication	KROMP-KOLB H. (2003) StartClim2003: First analyses of extreme weather events and their impacts on Austria
Research Management Process	The research priorities for each call are suggested by the Scientific Coordinator. They are discussed and agreed with the committee of funding institutions. Scientific board evaluate proposals, following an eval. Scheme. Ranking is presented in committee
Agency administering	The Federal Environment Agency, Austria is the programme manager
Funding Agency	Federal Ministry of Agriculture, Forestry, Environment and Water Management

4.2 Hungary

4.2.1 Water Resource Assessment

The landscape consists mostly of the flat to rolling plains of the Carpathian Basin, with hills and lower mountains to the north along the Slovakian border. Hungary has a moderate climate with strong continental influence (cold, cloudy, humid winters and warm to hot summers). Hungary's borders are crossed by 24 incoming rivers, which has an enormous effect on water management in the country. The three major rivers in Hungary are the Danube, Tisza and Dráva and from a hydrology and climate point of view the country can be divided in two different areas: the "Danube" to the west and the "Tisza" catchment to the east.

The Tisza sub-basin has both a pronounced mountain and lowland character as it stretches over the Carpathians and the Great Hungarian lowland. It stretches for 46,213 km² through Hungary, which accounts for 29.4% of its total length. The drainage basins of the tributaries of the Tisza River are rather different from each other in topography, soil composition, land use and hydrological characteristics. The 1,800-2,500 m high ridge of the Carpathian Mountains create in a half circle the northern, eastern and south-eastern boundary of the Tisza sub-basin. The western – south-western reach of the sub-basin is comparatively low,⁷ in some places – on its Hungarian and Serbian reaches – it is almost flat. Lake Balaton is the biggest lake in Hungary.

Table 9. Hungarian Water Resources

Environment - Water Resources		Mean total annual precipitations				
		Lowest annual mean				
		Highest annual mean				
		Annual renewable water resources (km ³ /yr) [source FAO 2005]			120	
		Length of watercourses				
River	Length		Watershed area			
	Total, km ²	in Hungary	Total, km ²	in Hungary, %		
Danube	2 860	417	817 000	5.7		
Dráva	695	143	40 076	10.4		
Tisza	977	597	157 183	29.7		
Maros	754	50	30 332	6.2		

Source: The Hungarian Central Statistical Office (HCSO)

4.2.2 Socio-economic Assessment

The private sector accounts for over 80% of GDP. Hungary gets nearly one third of all foreign direct investment flowing in to Central Europe. Foreign ownership of and investment in Hungarian firms are widespread, with cumulative foreign direct investment totalling more than US\$23 billion since 1989. Inflation and unemployment have been on the rise in the past few years, and they are expected to rise further. Foreign investors' trust in the Hungarian economy has declined, as they deem that the stringency measures planned in the second half

⁷ UNECE Our Waters: Joining hands across borders: First assessment of rivers lakes and wetlands of Europe.

of 2006 are not satisfactory, their focus being mainly on increasing the income side rather than curbing government spendings. Economic reform measures such as health care reform, tax reform, and local government financing are being addressed by the present government.

Source: Wikipedia

Table 10. Socio-economic resources of Hungary

Socio-economics Geography Land use Social	Area	93,000 km ²
	Population	10.10 million
	Inhabitants per km ²	108
	Permanent crops	2.06%
	Arable	49.58%
	other	48.36%
	Currency	Florint HUF
	Life expectancy at birth (Women, Men), 2003	77.38, 68.73
	Total labour force (000s), 2004	4.21
	Government type	Parliamentary Democracy
Size of GDP	Gross domestic product	176.3603 USD
	GDP per capita	17 483.1372
	Volume index of GDP per capita	62.0719
National income per capita	Gross national income per capita	16 476.8278
Water consumption	Total gross water abstractions	5 590.5
	Per capita water abstractions	550

[sources: CIA Factbook and OECD]

4.2.3 Legal, regulatory and management assessment

The government agency primarily responsible for the policies on protection of freshwater resources is the Ministry for Environment and Water. The basic regulatory framework consists of the Water Act of 1995, and the legal instruments on environmental impact assessments. In addition, there are important general provisions on freshwater resources under the Act on Environmental Protection (1995). The regional functions of water management are performed by the 12 Directorates for Environment and Water organised by catchments.

The National Environmental Programme includes substantial provisions and measures for the conservation and management of surface and subsurface water resources. Some of the key targets and approved policy directions are: regulation development to encourage sustainable and economical water use; improvement of water quality for the main watercourses/water bodies (Danube and Tisza Rivers, Lake Balaton); gradual increase (to a level of 65%) of the number of settlements with sewers; at least biological treatment of wastewater from sewers; nitrate and phosphorous load reductions for highly protected and sensitive waters.

4.2.4 Key IWRM research programmes

The Ministry of Environment and water coordinates environment, natural protection and water related R&D In 2000 it published a call for proposals for

R&D actions in five thematic fields. One of the most important scientific priorities of the Programme is “Water Management” and “Quality of Water”. The national directorate for Environment, Nature and Water as the body responsible for preparation of river basin management plans manages the investigations of background research for planning programme of measures. The regional directorates also get involved in applied sciences relating to water management problems. Ministry of Education The National Programme for Environmental Research and Development is formulated jointly by the Ministry for Environment and Water and the NCTD. The programmes place special emphasis on improving the technical and technological conditions for environmental protection. Elements of these programmes include: development of environmentally sound public utilities; technologies for healthy drinking water supply; environmentally-sound technologies integrated into production; material, energy and water saving technologies; and environmental sanitation. A Special Scientific Committee was established to deal with possible consequences of climate change. The Committee is an important advisory body elaborating long-term strategies and response measures to mitigate the adverse impacts.

Project Name	Assay of ecological water needs by point of view of WFD
Acronym	ECOWATER
Project Description	Determination of the necessary measures in order to protect good ecological status or potential on surface waters via aquatic biota. Pilot projects at Sebes-Körös Oxbow and Kis-Rába-Hanság (two pilot areas)
Research themes	Assay of ecological water needs on different hydrological featured pilot areas - Project1:Sebes-Koros Oxbow pilot area - Project2: Kis-Raba-Hansag pilot area
Agency administering	Directorate for Environment and Water

Project Name	National Environmental Remediation Program
Acronym	NERP
Project Description	The aims of the NERP are stated as: - identification of the magnitude of risk, - extent of pollution and deterioration of the groundwater and the geological medium, - lowering the risk of pollution in the endangered areas, and - reduction of the level, or elimination of pollution in the polluted area."
Start date	1994
Project funding	HUF 1000 billion estimated
End date	<ul style="list-style-type: none"> • Short-term stage (1996/1997), • Medium-term stage (1998/2002) • Long-term stage (2003/2030) in alignment with the National Environmental Programme, with six years schedules.
Research themes	VIZBAZIS. groundwater resources, vulnerability, protection zones of groundwater abstraction sites, applied hydrogeology, control of point and diffuse sources of pollution, risk assessment
Dissemination method	stakeholders & scientific
Dissemination details	Members of scientific working group called by VITUKI. Every vulnerable well fields subject of a single project, consultants for each project found through open tendering procedure.

Project Name	Methodological research for implementation of WFD
Acronym	FEVIZG

4.3 Romania

4.3.1 Water Resources Assessment

Table 11. Water resources of Romania

Environment	Actual renewable water resource (total)	211.9 km ³
Water Resources	Average precipitation in volume (10 ⁹ m ³ /yr)	151.95
	Average precipitation in depth (mm/yr)	637
	Groundwater: produced internally (10 ⁹ m ³ /yr)	8.3
	Surface water: produced internally (10 ⁹ m ³ /yr)	42
	Overlap between surface water and groundwater (10 ⁹ m ³ /yr)	8
	Water resources: total internal renewable (10 ⁹ m ³ /yr)	42.3
	Water resources: total internal renewable per capita (m ³ /inhab/yr)	1903.005
	Water resources: total external renewable (actual) (10 ⁹ m ³ /yr)	169.63
	Water resources: total renewable (actual) (10 ⁹ m ³ /yr)	211.93
	Water resources: total renewable per capita (actual) (m ³ /inhab/yr)	9534.371

[source: FAO]

4.3.2 Socio-economic Assessment

In 2006, according to the Romanian Statistics Office, GDP growth was recorded at 7.7%, one of the highest rates in Europe. Unemployment in Romania was at 4.5% in April 2007 which is very low compared to other middle-sized or large European countries such as Poland, France, Germany and Spain. Foreign debt is also comparatively low, at 20.3% of GDP. Exports have increased substantially in the past few years, with a 25% year-on-year rise in exports in the first quarter of 2006. Romania's main exports are clothing and textiles, industrial machinery, electrical and electronic equipment, metallurgic products, raw materials, cars, military equipment, software, pharmaceuticals, fine chemicals, and agricultural products (fruits, vegetables, and flowers). Trade is mostly centered on the member states of the European Union, with Germany and Italy being the country's single largest trading partners. The country, however, maintains a large trade deficit, importing 37% more goods than it exports.

Source: wikipedia

Table 12. Socio-economic resources of Romania

Socio-economics	Area	237,500km ²
	Population	22,276,056
Geography	Inhabitants per km ²	93.79
Land use	Arable	39.49%
Social	Permanent Crop	1.92%
	Other	58.59%
	Currency	Leu (RON)
	Life expectancy at birth (Women, Men), 2003	75.62, 68.41

	Total labour force (000s), 2004	9,330
	Government type	Republic
Size of GDP	Gross domestic product (us\$ billion)	98.84
	GDP per capita (us\$)	3477
Water consumption	Water Withdrawals: Annual total (FAO 2000)	23.8km ³
	Per capita water abstractions (FAO 2000)	1048m ³

[sources: CIA Factbook, OECD, FAO & World Bank]

4.3.3 Legal, regulatory and management assessment

Activity in the field of water management is now based on the new Water Law No. 107/1996. Starting from Constitution provisions and from the provision of the Law for environmental protection (No. 137/1995), this law establishes conservation and protection of water resources by maintaining an ecological balance, the application of key economic factors in water system management and participatory decision-making for all stakeholders.

The Ministry of Agriculture, Forests, Waters and Environment (MAFWE) draws up the national strategy and policies in water resources management and protection. Within MAFWE, the State Water Inspectorate is responsible for the inspection and control of implementation of the legal provisions. The local Environmental Protection Inspectorates are responsible for issuing licences and permits as well as for inspection and control of water quality and emissions into water bodies. The National Administration "Apele Romane" is the authority in charge with the implementation of the 2000/60/UE Water Framework Directive.

During 2001, 11 River Basin Committees were established in Romania, at the level of each river basin, organized on the same river basins as National Administration "Apele Romane" Water Branches. The Committees join the principal actors of the water management and environmental protection, respectively representatives from the Ministry of Waters and Environmental Protection, the Ministry of Health and Family (nowadays there are two ministries: Ministry of Health and Ministry of the Labour, Social Solidarity and Family), County Administration, Municipal and Local Mayors, River Basin Authority and Water Management Systems, Environmental Protection Inspectorate, water users from industry and agriculture, environmental non-governmental organizations or similar associations.

The Ministry of Environment and Water Management (MEWM) is the central public authority responsible for environmental protection and water management. The national water authority "Apele Romane" is the agency tasked to manage all waters under the authority of MEWM.

4.3.4 Key IWRM research programmes

Project Name	Danube delta Nucleus Programme
Acronym	DELTA
Project Description	Guidelines for good economic practices with low anthropogenic pressures, - Characterisation of biotic and non biotic components of aquatic ecosystems, - Measures to protect species and habitats designated under Directives 92/43/EEC and 79/409/EEC. This programme is a follow on from the previous Danube programme 2003-2005
Start date	2006
End date	2008
Research themes	<ul style="list-style-type: none"> - Research concerning a new delimitation of the functional area of the Danube Delta Biosphere Reserve (project leader - Dr. Otel Vasile) - Evaluation of dangerous and priority dangerous substances within the mineral and organic deposits from the Danube Delta (project leader - Liliana Teodorof) - Researches concerning the influence of the eutrophication of the DDBR lakes on the structural dynamic of the plankton (project leader - Dr. Liliana Torok) - Characterization methodology of the biological status of the Danube Delta lakes using the aquatic macroinvertebrates (project leader - Ibram Orhan) - Research for a trophic spectrum evaluation of some fish species industrially caught in DDBR (project leader - Mihaela Tudor) - Testing and adapting the European technologies for ecological status characterization of the DDBR surface waters (project leader - Cristina David) - DDBR medicinal plants atlas - electronic format (project leader - Silviu Covalio) - Research on the biology of some bird species of conservative interest , according with the international conventions Romania has adhered to (project leader - Dr. J.B.Kiss) - Research on establishing preservation measures of the European mink (<i>Mustela lutreola</i>) and otter (<i>Lutra lutra</i>) from Danube Delta, threatened species at international level (project leader - J.B.Kiss) - Identification of the main used habitats and monitoring the numerical and spatial dynamics of the hunting bird species from DDBR (project leader - Marinov Mihai) - Research concerning the migration of the early life stage sturgeons in the Danube River for a better operation of the International Station for monitoring the migratory fish species in Isaccea Romania (project leader - Paraschiv Marian) - Genetic research supporting the National Programme for restoration of sturgeon populations in the Danube River (project leader - Radu Suciu) - Evaluation of the status of some commercial fish species with decreasing populations exploited in DDBR and establishment the conservation and sustainable use measures (project leader - Dr. Ion Navodaru) - Research for improving the evaluation methodologies of comestible frogs from DDBR (project leader - Zsolt Torok) - Research for improving the evaluation methodologies concerning the analysis and management of the fisheries from DDBR (project leader - Dr. Irina Cernisencu) - Research for evaluating the present status and establishing the management plan of the restored areas from DDBR (project leader - Marian Tudor) - Research concerning the evolution of the restoration process in Holbina-Dunavat area (project leader - Marian Tudor) - Research for underlying the ecological restoration measures of the agricultural polders from DDBR (project leader - Dr. Jenica Hanganu) - Soil evolution within the agricultural polders from DDBR (project leader - Marian Mierla) - Research concerning the values of cultural heritage of rural landscape for fundamenting the conservative measures (project leader - Alina Poruncia) - Research on ecological agriculture in DDBR (project leader Dr. Vasilica Ignatescu) - Establishment the rule of fishculture practice in the fishponds from DDBR (project leader - Virgil Mitache) - Support research on the regulation of the tourist activity in DDBR (project leader - Diana Bota) - GIS applications - support for the DDBR management (project leader - Dr. Ion Grigoras) - Dynamic Geographical Landscape Analysis for Danube Delta based on the synthetic indices (DPSIR) of the European Environment Agency (EEA) (Project leader - Dr. Iulian Nichersu) - Studies concerning the surface deposit succesion in the Danube Delta (project leader - Dr. Jenica Hanganu)
Research Management Process	<p>The research priorities are derived from the objectives of sector strategy of the government for environment. They could be up-dated in order to fulfil international agreements as well.</p> <p>Evaluation procedure is set out in government regulations. organised by MER- panel of 3 evaluators, member of speciality commission (environment) is nominated by</p>

	MER and each project-component of the proposed programme is evaluated
Agency administering	Danube Delta National Institute
Funding Agency	Ministry of Education and Research

Project Name	Marine Ecosystem conservation & sust. utilisation
Acronym	Incdm2 Constanta - CEMAR
Project Description	Research priorities defined according to Government Programme 2001-2004, National Strategy for Environment Protection 2002-2004 and National Plan for Research, Development and Innovation. Periodic calls for proposals from national authorities. Previous INCDM1 CEMAR programme from 03-05 was on Ecological Assessment for littoral lakes
Research themes	03-05: Ecological state assessment of littoral lakes from the Dobrogea central and southern areas; solutions for natural biological potential rehabilitation. Expected results - databases, environmental impact assessments & scientific support for regional coop. Data bases (erosion, oceanography, eutrophication, pollution, environment indicators, biodiversity, living resources), environment impact assessments / sheets, scientific substantiation of regional / international co-operation.

Project Name	METHODOLOGIES FOR THE IMPLEMENTATION OF WATER FRAMEWORK DIRECTIVE 2000/60/EC IN ROMANIA, CONCERNING GROUNDWATER
Acronym	ICIM1
Project Description	Methodologies and instructions for the implementation of Water Framework Directive for the national water resources, legislation harmonisation, waste-water, nitrates, ecotoxicology, land management, characterisation, monitoring.
Start date	2000
Project funding	Specific objectives The following specific objectives will help to reach the overall objective: For the Somes river basin: - Drawing up a river basin management plan in line with the provisions of the WFD; - Producing unitary implementation methodologies for the activities of the river basin management plan and producing programmes of measures in order to achieve "good status"; - Sharing experience gained within this project with other river basins. For the Arges river basin: - Acquiring a better knowledge about water bodies in the Arges river basin; - Establishing of a Standard Operational Procedure for water quality monitoring; - Establishing priorities for ecological rehabilitation of affected water bodies in the Arges river basin; - Using of experience gained within this project in other river basins
End date	2009
Research Management Process	TOR are prepared by Ministry of Water and Env. Management. Technical proposals are made by diff. research institutes & author'sd by Ministry. Assessm't of technical proposals made by technical commissions (tech experts from Ministry, academia, res institutes)

5 SOUTHERN EUROPE



5.1 Greece

5.1.1 Water resource assessment

Greece consists of a mountainous and craggy mainland jutting out into the sea at the southern end of the Balkans. Four-fifths of Greece consist of mountains or hills, making the country one of the most mountainous in Europe. Western Greece contains a number of lakes and wetlands and it is dominated by the Pindus mountain range. The three distinct types are the Mediterranean, the Alpine and the Temperate types. The first one features mild, wet winters and hot, dry summers. Temperatures rarely reach extreme values although snowfalls do occur occasionally even in the Cyclades or the Dodecanese during the winter months¹. The Alpine type is dominant mainly in the mountainous areas of Northwestern Greece. Finally, the Temperate type affects Central Macedonia and East Macedonia and Thrace; it features cold, damp winters and hot, dry summers. Athens is located in a transitional area featuring both the Mediterranean and the Temperate types. It averages about 16 inches of rain annually.

Table13 – Water resource indicators of Greece

Environment	Mean total annual precipitations	849mm
Water Resources	Lowest annual mean	400mm
	Highest annual mean	1350mm
	Annual volume of useable water (precipitation and river discharges – evaporation)	52,500km ³ /yr
	Annual renewable water resources (km ³ /yr) [Source : Eurostat 2005]	72
	Length of watercourses	3000m

5.1.2 Socio-economic assessment

Greece produced a GDP of \$251.7 billion in 2006. The principal economic activities mainly include the tourism and shipping industries, banking and finance, manufacturing and construction and telecommunications. Greece ranks 24th in the 2006 human development index, it has an average per capita income that has been estimated at \$27,360 for the year 2007, or around 93% of the EU average.

Today, the service industry (74.4%) makes up the largest, most vital and fastest-growing sector of the Greek economy, followed by industry (20.6%) and agriculture (5.1%). The tourism industry is a major source of foreign exchange earnings and revenue accounting for 15% of Greece's total GDP and employing (directly or indirectly) 659,719 people (or 16.5% of total employment). In 2005, Greece welcomed almost 18 million visitors and in 2006 that figure almost reached 20 million.

The Greek banking & finance sector is also an important source of revenue and employment and Greek banks have invested heavily in the Balkan region. The manufacturing sector accounts for about 13% of GDP with the food industry leading in growth, profit and export potential.

High-technology equipment production, especially for telecommunications, is also a fast-growing sector. Other important areas include textiles, building materials, machinery, transport equipment, and electrical appliances.

¹ <http://en.wikipedia.org/wiki/Greece#Geography>

Construction (10%GDP) and agriculture (7%) are yet two other significant sectors of the Greek economic activity.

Table 14 – Socio-economic indicators of Greece

Socio-economics Geography Land use Social	Area	131,957 sq km
	Population	11 171 740
	Inhabitants per km2	84.67
	Urbanisation	4%
	Mountainous	20%
	Pasture	40%
	Arable	30%
	Forests	20%
	Currency	Euro
	Total Labour Force	4 846.3
	Life expectancy at birth	<i>male</i> : 76.85 years <i>female</i> : 82.06 years
	Government type	Parliamentary republic
	GDP National income per capita	Gross domestic product
GDP per capita		\$23,500
Volume index of GDP per capita		102.2765
Gross national income per capita		29,212
Water consumption	Total gross water abstractions	8 695.4 mio/m ³
	Per capita water abstractions	830

Source: OECD 2005 & CIA factbook

5.1.3 Legal, regulatory and management assessment

Water management in Greece is in transition currently from the Ministry of development to a special secretariat within the Ministry of Environment, as a central water service. Ministries assign projects (not research) to private companies, universities etc after tenders relating to the management plans for WFD from the Ministry of Development and projects relating to the harmonization of the WFD from the Ministry of Environment.

5.1.4 Key IWRM research programmes

National Strategy for Water Resources (NSWR) contains a wide series of projects, programmes and actions, according to the requirements of the WFD that will allow meeting set targets at national, EU and international levels, by fully implementing the WFD and law 3199/03.

Priorities...

- networks to monitor quality of marine environment, quality of coastal bathing waters, quality of underground water reserves
- proposed on monitoring sea and groundwater quality 2007-2013.
- Development of water pricing policies that enhance the sustainability of water resources
- Good practice guidance on the adequacy of controls on drinking water quality 2007-2013.
- Monitoring of sea water quality and marine environment.
- A National Programme for the reduction of dangerous substances pollution.
- Setting of new maximum permissible levels of harmful substances concentrations in water resources as the basis of a sound system for

liabilities, water protection and promotion of remedial measures, are required. More specifically,

- Development of a new monitoring network for inland surface, transitional, coastal and ground waters, including the development of monitoring programs for biological quality parameters and the assessment of their ecological quality is proposed.
- Monitoring of sea water quality and marine environment , agricultural nitro-pollution 2007-2013.
- Development of Management Plans in Water Districts for each river basin of the country is proposed by the National Strategy for Water Resources (NSWR).
- Public participation on the management plans at a river basin level is high in the priorities for the next Programme Period 2007-2

Project Name	3 rd Community support programme
Project Description	<p>Measure 7.3 Utilisation of Natural Resources and support for compliance with environmental commitments. The objectives of the Measure are as follows:</p> <ul style="list-style-type: none"> • Prospecting for, evaluation and listing of energy raw materials, minerals and other natural resources. • Ensuring the country's supplies of energy and water of appropriate quality for all users. • Support for SMEs in the branch which are active in the field of natural resources. • Protection of the environment. • Compliance with the country's commitments related to greenhouse gas emissions, and • Increasing employment in the regions.
Start date	2000
Project funding	465,08 MEURO (for axis 7: Energy and sustainable development)
End Date	2006
Research Themes	<p>Actions include <i>inter-alia</i> the following:</p> <ul style="list-style-type: none"> • In the context of the operation of the pressure-metering network financed by the OP "Energy" 1994-1999, continued listing of the hydro-geological characteristics of underground waters, thermo-metallic waters and of the country's aquifer systems. This geological information will be fed into a unified geographical information system developed in the context of the OP "Information Society" (Measure 3.1) after assessment of the existing infrastructure of IT systems developed by funding from the CSF 1994 - 1999 and available for public and private agencies and private individuals (subject to assessment, this action also includes the possible supplementation of infrastructure for the pressure-metering network and support for its operation). The action will be implemented in collaboration with the MERPPW. • Studies to support the rational management of water resources, projects in support of water policy, studies and the preparation of management plans for water resources. The projects in support of water policy relate to the creation of management and operational infrastructure at the level of catchment basins, and will be implemented after the formulation of an effective statutory framework for the management of water resources in Greece, pursuant to the requirements of European Parliament and Council Directive 2000/60/EC of 23 October 2000 on the establishment of a framework for Community action in the sector of water policy. That framework will be determined by the end of 2001 following a proposal by the MoD in close collaboration with the MERPPW and other relevant Ministries.

	<ul style="list-style-type: none"> • Studies and activities to support compliance with the country's commitments in relation to greenhouse gas emissions from energy intervention.
<p>Research Management Process</p>	<p>For projects and activities in the water resources sector a proportion of at least 55% of the Measure's public expenditure will be used. The ultimate beneficiary of the projects included under actions 1, 2 and 3 is the IGMR. The IGMR will adopt appropriate measures for the gradual intensification of its collaboration with the other mechanisms for the control and monitoring of water quality, and in parallel to co-ordinate its actions with corresponding actions of the Regional Programmes. The ultimate beneficiary of the projects included in actions 4, 5 and 6 is the Ministry of Development. Those projects will be implemented by private or other agencies following open competition. The action relating to the development, promotion and application of new technologies, materials and uses of mined raw materials, will be implemented in accordance with the rules of the European Union relating to State aid for SMEs. The related scheme will be notified to the European Commission.</p>
<p>Agency administering</p>	<p>General Secretariat for Research and Technology</p>
<p>Funding Agency</p>	<p>Ministry for Development</p>

5.2 Portugal

5.2.1 Water Resource Assessment

Portugal is the most western country of the European Union. Situated in the Iberian Peninsula Portugal is heavily dependent on Spain for its water resources².

Table 15 – Water resource indicators of Portugal

Environment - Water Resources	Mean total annual precipitations	910 mm
	Average run-off (50% originates in Spain)	700 mm/year
	Water availability (000) m3	3.25

For many of the rivers (Mina and Lima) the main pressures on water resources are from agricultural activities, mainly the use of fertilizers and pesticides, as well as irrigation. For the Mina eutrophication is generally decreasing along the main stem of the river, mainly due to the river's self-purification capacity. There is a risk of contamination due to several abandoned ore mines. There is also some risk of accidental water pollution from industrial wastewater discharges.

5.2.2 Socio-economic assessment

Table 16 – Socio-economic indicators of Portugal

Socio-economics	Area	92,000 km ²
	Population	10 million
Geography	Inhabitants per km2	90 - 130
Land use	Arable	17.29%
	Permanent crops	7.84%
Social	Other	74.87%
	Life expectancy at birth (Women, Men), est 2007	81.36, 74.6
	Total labour force (000s), 2006 est.	5,590
	Government type	Parliamentary democracy
	GDP (US\$)	Gross domestic product
	GDP per capita	19 889.3918
	Volume index of GDP per capita	73.9217
	Gross national income per capita	19 616.7866
Water consumption	Total gross water abstractions	8 808
	Per capita water abstractions	860
	Irrigated Land	6,500 sq km

[source: CIA Factbook & OECD]

Agriculture being the main pressure the impacts from manufacturing industry are minimal and cause hardly any impact but this depends on the basin as there are regional variations. For example on the Mina there are two abandoned wolfram mines that have a local impact on the quality of water resources and on the Lima there are abandoned ore mines. Transport is another pollution source, due to exhaust gases, fuel transport and spills or leakages of dangerous substances.

²<http://www.rec.org/REC/Programs/Telematics/DETERMINE/WaterSession/JRibeiraDaCosta.html>

5.2.3 Legal, regulatory and management assessment

Attention to water resources has a long tradition in Portugal, with the first Water Law having been published in 1919. INAG, the Water Institute, is the body responsible for water resources planning and coordination in Portugal, together with the Regional Planning Offices based within Portugal's five main regions.

Law 58/2005, of December 29, 2005 (the new "Water Framework Law") establishes the basis and the institutional framework for water management policy in Portugal. This new law aims at providing the means for the sustainable management and protection of water resources to be undertaken by regional water management authorities with assigned territories designed around river basins.

Since 2002, the status of the Mino River in Portuguese territory has improved significantly. This was mainly due to the implementation of the Portuguese National Water Plan (PNA) and the Portuguese Water Supply and Residual Water Treatment Plan (PEAASAR), notably the specific Residual Water Treatment Plants (ETARs) to treat industrial and urban sewage. Some occasional pollution events still occur due to inappropriate agricultural practices.

Several public authorities are created and called upon to assist in the planning and execution of regulations and measures for the implementation of sustainable water use. Notably among these authorities are the newly created River Basin administrations ("ARHs") and the existing and now restructured National Water Institute ("INAG"). The new Water Framework Law provides for the creation of administrative regions for each identified river basin – River Basin Districts – some of which are of international nature (most of the largest Portuguese rivers have international basins shared with Spain).

The new Water Framework Law also provides for the definition of several water resource planning and development instruments and determines their respective scope of intervention. INAG has the primary responsibility of issuing planning instruments: (i) the National Water Master Plan; (ii) river basin management plans, and (iii) specific water management plans, which cover specific geographical areas or problems, water type or aspects of economic activities with special interaction with water. According to what is now a major principle in Portuguese environmental laws, all water sector stakeholders are welcome to participate in the approval and execution of both the National Water Master Plan and the water management plans.

An additional set of measures is foreseen in order to systematically protect and enhance water resources. These are to be implemented by each ARH, in cooperation with the municipalities and private owners of land where water resources are raised or deposited. The Water Framework Law also sets out rules and imposes obligations for the use of water resources, in accordance with the principles of precaution and of promoting sustainable and efficient use of water resources. The ARH's will be responsible for granting licenses for activities such as water extraction. The ARH's will also assess a charge on each license granted for the use of public domain water resources and for

carrying out activities with possible negative impact on the quality and quantity of water resources³.

5.2.4 Key IWRM research programmes

Project Name	Operational programme: Science Technology and Innovation
Acronym	POCTI
Project Description	<p>The operational program Science, Technology, Innovation has part of its objectives related to the environment and sustainable development. In this direction the aim is to reduce the impact of development to the environment. The goal is to contribute to the development of productive activities in harmony with the environment. The incorporation in the productive systems of more qualified human resources creates conditions for the emergency of two potentialities in terms of sustainable development - a economy in managing resource use through introduced improvements to processes and the reduction in the consumption of natural resources and energy.</p> <p>Alongside this a significant proportion of the supported scientific inquiry exists is of direct value for the environment, for example, projects in the domain of life sciences, and looking at diverse scientific opportunities in the field of the environment.</p>
Start date	Annual funding programme
Project funding	
End Date	No end date set?
Research Themes	Previously funded projects can be found on the FCT website
Research Management Process	<p>http://alfa.fct.mctes.pt/index.phtml.en</p> <p>Annual call for projects.</p>
Agency administering	Foundation for Science and Technology
Funding Agency	Foundation for Science and Technology

³ http://www.mirandaalliance.com/Docs/Articles/AO_ILO_Portugal.pdf

Spain - IWRM Context

5.2.5 Water resources assessment

Spain is the largest country on the Iberian Peninsula and includes the Balearic Islands in the Mediterranean Sea, the Canary Islands in the Atlantic Ocean as well as a number of inhabited islands in the Strait of Gibraltar. To the east it is bordered by the Mediterranean Sea, to its west by the Atlantic Ocean and to the north by the Cantabric sea. The mainland of Spain is characterised by mountain ranges (like the Pyrenees or the Sierra Nevada), high plateaus (e.g. Meseta Central), narrow coastal plains (e.g. the Andalucian Plain), and some lowland river valleys (like the Ebro basin).

Table 17 – Water resource indicators of Spain

Environment	Actual Renewable Water Resources: Total 1940-1996 (Water in Spain-MIMAN, 2000)	111km ³ /yr
Water Resources	Mean total annual precipitation (1940-96)	684mm
	Highest annual mean	2300 mm
	Annual volume of useable water (available resources?) 1993 estimation (precipitation and river discharges minus evapotranspiration)	46,600 hm ³ /yr
	Length of watercourses	Highly variable

In Spain, three climatic types are identifiable: a continental, a maritime, and a Mediterranean climate. The continental climate covers the majority of the mainland, influencing especially the Meseta Central. A maritime climate prevails in the northern and south-western part of the country, from the Pyrenees to the northwest region. The Mediterranean climatic region extends from the Andalucian Plain along the southern and eastern coasts up to the Pyrenees, where the most flash flood events in Spain are produced (because of locally limited and very high intensity storm rainfall events besides and important watershed). Major river systems in Spain are the Ebro, the Douro, the Tajo, the Guadiana, the Guadalquivir, the Miño, the Segura, the Júcar, and the Turia basins.

5.2.6 Socio-economic assessment

Table 18 – Socio-economic indicators of Spain

Socio-economics	Area	505,000 km ²
	Population (2007, INE)	45,000.000
Geography Land use Social	Inhabitants per km2 (2007?)	87
	Mountainous +urban Other? (MAPA, 2007)	8,700 ha
	Pasture (MAPA, 2004)	6,500 ha
	Arable (MAPA, 2004)	17,000 ha
	Forests (MAPA, 2004)	16,800 ha
	Currency	€
	Life expectancy at birth (Women, Men), 2005, INE	83,4; 76,6
	Total labour force (2007, INE)	22,000.000
	Government type	Monarquia parlamentaria
	Size of GDP (US\$)	Gross domestic product (OECD)
GDP per capita (OECD)		27 400.0875

	Volume index of GDP per capita (OECD)	92.1738
National income per capita	Gross national income per capita (OECD)	27 028.1783
Water consumption	Water withdrawals total (FAO 2003)	35.63km3
	Water withdrawals per capita per person (FAO 2003)	875m3

5.2.7 Legal, regulatory and management assessment

The 1985 Water Law, and further amendments, is the legal framework which defines the legal and regulatory policies of water resources in Spain. The Ministry of Environment and the General Directorate of Water are in charge of water related issues and actions. The State assumes competences regarding legislation, EU directives transposition, water concessions and exploitation when water basins are shared by more than one Autonomous Community (otherwise the AACC are fully responsible).

The National Water Council, constitutes the national advisory body conceived for water resources recommendations according to the Water Act. The River basin districts (Confederaciones Hidrográficas) are the autonomous bodies responsible of water administration, operation and management within the corresponding river basins. Their structure is composed by a governing body, advisory body (Water council) and management body.

Each of the Autonomous Communities has developed a series of regulations concerning management and exploitation of continental water resources, when these resources flow entirely inside the Autonomous Community territory. These regulations concern different phases in the water management, i.e. hydraulic infrastructures, water supply and wastewater disposal. They do though assume State regulation when a legal gap exists.

5.2.8 Key IWRM research programmes

A total of about 240 research projects in the field of water resources have been funded within the R&TD National Plan during the last 8 years. For the period 2004-2007, research in the field of water is included in the National Programme of Biodiversity, Earth Science and Global Change; which includes the Earth Science sub programme. The priority of research topics include water resources characterization; water quality; global change effect in water resources; water management; water economy and hydrologic risks. Financed research (projects being financed) refers to water quality, water management, ecologic aspects of water, socio- economic aspects of water, flood and droughts mitigation among others. Information regarding to the approved projects is available at: www.proyectosh2o.upc.es.

Water Research is undertaken through the Ministry of Education and Science at the national level and defined through the national plan, which currently runs for 4 years, having recently launched the new framework research National Programme for the 2008-2011 period. Research in the field of water is basically carried out by state-owned research centres through universities & public research institutions.

Project Name	PLAN NACIONAL DE I+D+i
Acronym	IDI
Project Description	<p><i>Within the framework of the National Plan the intention was to promote the investigation of quality, to reduce fragmentation of the research and to strengthen the participation of investigators with a high level of dedication to each project.</i></p> <p><i>MEC also aimed to support the development of coordinated projects that mobilize the efforts towards knowledge exchange, to promote the specialization of the groups which they reach the highest level of excellence in his disciplines and, alongside this to promote multidiscipline research to mobilize researchers towards complementary knowledge of a diverse range of fields.</i></p>
Start date	2004
Project funding	1.5 m euros?
End Date	2007
Research Themes	<ul style="list-style-type: none"> - Biomedicine. - Biotechnology. - Fundamental Biology. - Resources and agro-alimentary technologies. - Environmental sciences and technologies. - Earth biodiversity, sciences and global change. - Energy. - Transport. - Construction. - Chemical sciences and technologies. - Materials. - Design and industrial production. - Space. - Astronomy and astrophysics. - Particle physics. - Mathematics. - Physics. - Security. - Electronic technology and of communications. - Computer science technologies. - Technologies of services of the society of the information. - Humanities. - Social, economic and legal sciences. - Accidental marine spills. - Nanoscience and nanotechnology. - Genomic and proteómica. - Functional foods. - Complex systems. - E-Science.
Research Management Process	<p>Research priorities are defined every four years through an ad hoc committee of scientist at National level Call for proposals is once a year for research projects. Proposals finally selected and financed after free competence system - Equal probability</p>
Funding Agency	Ministry for Science and Technology

Project Name	PLAN NACIONAL DE I+D+i
Acronym	IDI
Start date	2008
End Date	2011
Research Themes	- details not currently available
Research Management Process	<p>Research priorities are defined every four years through an ad hoc committee of scientist at National level Call for proposals is once a year for research projects. Proposals finally selected and financed after free competence system - Equal probability</p>
Funding Agency	Ministry for Science and Technology

6 NORTH-WEST EUROPE



6.1 Belgium

6.1.1 Water Resource Assessment

Belgium shares borders with France, Germany, Luxembourg and the Netherlands. Belgium has three main geographical regions: the coastal plain in the north-west and the central plateau both belong to the Anglo-Belgian Basin; the Ardennes uplands in the south-east are part of the Hercynian orogenic belt. The Paris Basin reaches a small fourth area at Belgium's southernmost tip, Belgian Lorraine.

The climate is maritime temperate, with significant precipitation in all seasons. Between 2000 and 2006 the average monthly rainfall was 74mm; this is nearly 10mm above last century's normal values.

Table 19 – Water resource indicators of Belgium

Environment	Geography	Area	33990 km ²
		Population	10,392,226
		Inhabitants per km ²	305.8
		Land area (total – surface water area)	30528km ²
	Climate	Average annual precipitation	890mm
		Monthly low	54mm
		Monthly high	78mm

[sources: CIA Factbook & OECD]

6.1.2 Socio-economic Assessment

Belgium's economy and its transportation infrastructure are integrated with the rest of Europe. Its location at the heart of a highly industrialized region helps make it one of the world's ten largest trading nations. The economy is characterized by a highly productive work force, high GNP, and high exports per capita. Belgium's main imports are food products, machinery, rough diamonds, petroleum and petroleum products, chemicals, clothing and accessories, and textiles. Its main exports are automobiles, food and food products, iron and steel, finished diamonds, textiles, plastics, petroleum products, and nonferrous metals. The Belgian economy is heavily service-oriented and shows a dual nature: a dynamic Flemish economy, with Brussels as its main multilingual and multi-ethnic centre, and a Walloon economy that lags behind. One of the founding members of the European Union, Belgium strongly supports an open economy and the extension of the powers of EU institutions to integrate member economies. As of 2006, the budget was balanced and public debt was equal to 90.30% of GDP. In 2005 and 2006, real GDP growth rates of 1.5% and 3.0%, respectively, were slightly above the average for the euro area. Unemployment rates of 8.4% in 2005 and 8.2% in 2006 were close to the area average.

Table 20 – Socio-economic indicators of Belgium

Environment	Water consumption	Total gross water abstractions (millions m ³)	6 749.23
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	Per capita water abstractions (m ³ /capita)	650
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Source: OECD

6.1.3 Legal, regulatory and management

In terms of water resource management policy-making competence has been devolved to the federal states since the 1980. Consequently, any analysis of water issues in Belgium has to consider three regional policies regarding Flanders, Wallonia and the Region of Brussels-Capital. In each region, water management is on the way towards integration. However, the respective policies of water supply and sanitation have been considered rather independently. In Flanders, sanitation activities are embedded in a global water quality policy, while in Wallonia a company supervises the whole water supply and sanitation sector, but operation remains in the hand of distinct operators. In Brussels-Capital, integration is yet to be completed.

In the period leading up to 1993, Belgium went through a series of institutional reforms which transformed it into a federal state made up of three regions and three linguistic communities. Since then, environmental responsibilities have been clearly defined and the federal, regional, community and local authorities have done a great deal to accelerate efforts to reduce pollution, protect nature and biodiversity, and also promote sustainable development.

There is still work to be done and the following recommendations for water resource management were proposed¹:

- review and revise manure management and fertiliser use policies in order to further reduce nutrient loading of ground and surface waters;
- bolster current efforts to reduce pesticide contamination of water sources (e.g. by increasing the rate of the existing pesticide tax);
- maintain the recent acceleration of construction of waste water infrastructure, including upgrading existing sewerage networks; ensure that financing arrangements do not slow progress;
- improve synchronisation in the construction of regional waste water treatment and municipal sewerage infrastructure;
- firmly implement measures to achieve full cost recovery of sewerage and waste water activities through “polluter pays” charging systems, with due regard to social concerns;
- speed up the provision of sewage treatment for all dwellings outside zones served by public systems;
- formulate measures to identify and remove remaining and new sources of hazardous substances.

6.1.4 Key IWRM research programmes

The PPS Science Policy is a federal administration that is responsible for the preparation and implementation of research programmes in several fields (fundamental research, sustainable development, social cohesion, information society, space technology ...) with the aim the development of a

¹ Recommendations were formally approved by the OECD Working Party on Environmental Performance

permanent knowledge resource within scientific and technical spheres at the service of the Federal Authority. The PPS Science Policy manages an annual budget of about 517 million euro. It is also responsible for 10 Research Institutions. The PPS Science Policy coordinates the Belgian participation to the management of European activities (6th Framework programme, COST, EUREKA, GMES, INTAS,) with the Belgian Communities and Regions. Notwithstanding that water management issue is a main regional competence; the PPS Science Policy is the only government body that has a specific Multi annual research programme on terrestrial ecosystems, including freshwater ecosystems of temperate Regions. This programme is part of the head plan “A science for a sustainable development” aiming at improving scientific understanding as a fundamental basis for sound sustainable decision-making. The programme is developed within the framework of Co-operation agreements with the Belgian Regions and Communities in order to insure the necessary collaboration with the federated entities, in particular for supporting the implementation of the EU Water Framework Directive. More generally, the freshwater programme lies within the scope of the UN Climate Change Convention, the Convention of Biological Diversity, the Ramsar Convention (wetland protection). The programme is implemented by calls for proposals open to universities and public research institutions. Since 2001, teams from European universities or public research institutions are able to join Belgian teams applying for funding and participate as a “minor” partner in the projects. Proposals are funded after a international peer review followed by a strategic evaluation by the steering committee of the programme, which is composed of participants from the concerned administrations. The yearly budget of the Multi annual research programme on freshwater ecosystems is approximately 1 Mio EURO. In Wallonia, the Environment Centre of the University of Liege manages the research programme for implementing the Water Framework Directive. The PIRENE programme listed above covers a wide range of issues relating to water resources including socio-economic issues. Integrated is provided through a broad range of stakeholders in the steering group, such as industry, ministries and municipalities.

Regions are supporting specific applied research in support to their competences. The Belgian Federal Science Policy Office, research programmes Department leads on the implementation of multi-annual research programmes, actions and networks on national or international levels. The programmes are implemented by calls for proposals. Proposals are funded after a peer review followed by a strategic evaluation by the steering committee of the programme, which is composed of participants from the concerned administrations. The priorities for the next years related to sustainable development are Transport & mobility, Agro-food, Health, Climate - incl. Antarctic research, Biodiversity - Antarctica & North Sea, Atmospheric processes, Terrestrial & marine ecosystems and Clean technologies.

Project Name	Federal Research Programmes
Acronym	
Project Description	The Federal Government finances multi-annual research programmes with the general aim of strengthening the scientific knowledge in Belgium, and the specific aim of supporting scientific policy executed by the federal authority. The research areas that are chosen are part of the horizontal research priorities for the Government and should contribute to the debate and solutions on societal issues and developments.

	<p>There are three main domains covered by these programmes:</p> <ul style="list-style-type: none"> • Sustainable development during the period 2000-2006 with a budget of €71.6 million. It focuses on the practical implications of policy implementation in this area as well as clarifying the concept itself. • Social Cohesion during the period 2000-2005 with a budget of €18.1 million. This socio-economic programme covers a vast range of subjects including drug issues, participative democracy and the modernisation of the administration of authorities. • The Information Society programme lasts from 2001-2007 with a budget of €15.4 million. The programme aims to promote the interest of those that develop new applications in response to user needs. The programme furthermore looks at the development of conditions for using new technologies in an inter-disciplinary manner. • Finally, it promotes the increased awareness, learning and knowledge of the process of innovation.
Start date	1994
Project funding	26.5 mEuro (2004)
End Date	No end date proposed
Research Themes	<p>Not full list:</p> <p>Action in support of the federal authority's strategic priorities (AP) Bilateral agreements (BL) EUREKA (EU) Global change, ecosystems and biodiversity SPSP 2 (EV) Mixed Actions (MA) Multiannual information society support programme (I2) Research programme for earth observation "STEREO" (SR) Research programme in support of the federal drugs policy document (DR) Science for a Sustainable Development (SSD) (SD) Scientific support for the exploitation of the "vegetation" instrument (VG) Support programme for the use of "ORFEO" data (Optical and Radar Federated Earth Observation) (OR) Supporting actions of the scientific support plan for a sustainable development policy SPSP 2 (OA) Sustainable production and consumption patterns SPSP 2 (CP)</p>
Agency administering	Federal Science Policy Office (BELSPO)

Project Name	Global change, ecosystems and biodiversity
Acronym	SPSP 2
Project Description	<p>The Second multi-annual scientific support plan for a sustainable development policy - extended over the period 2001-2005 - is clearly linked, as appears from the title, to the first multi-annual scientific support plan, which ended in 2001. The SPSP II maintains the general objectives of SPSP I, namely :</p> <ul style="list-style-type: none"> - to clarify the utmost complex problematic of sustainable development; - to collect and interpret the scientific basic information, which can give direction to the preparation of a sustainable development policy and its execution; - to formulate proposals and to elaborate instruments in order to set up, evaluate and direct a sustainable development policy.
Research Themes	<p>This plan is mainly composed of two complementary parts :</p> <ul style="list-style-type: none"> - one part "Sustainable production and consumption patterns" - one part "Global change, ecosystems and biodiversity" <p>The second part "Global change, ecosystems and biodiversity" addresses the global environmental issues relating to atmosphere and climate, to ecosystems and to biodiversity, as well as to the effects of the pressure of human activity. The research contributes to a better understanding - via field studies, observation</p>

	<p>and modelling on various scales - of the flows of water, energy and matter which are generated within and between the environmental compartments earth, sea and atmosphere, as well as the alteration of these flows.</p> <p>The following three themes are more specifically studied :</p> <ol style="list-style-type: none"> 1. Atmosphere and climate: including connected Antarctic research; 2. Marine ecosystems and biodiversity; 3. Terrestrial ecosystems and biodiversity: (including wetlands) of the temperate regions. <p>The following parts are treated within the themes mentioned above :</p> <ol style="list-style-type: none"> a. North Sea; b. Antarctic; c. Biodiversity.
Publication	<p>http://www.belspo.be/belspo/fedra</p>
Agency administering	<p>Federal Science Policy Office (BELSPO)</p>

6.2 France

6.2.1 Water Resource Assessment

France has the largest land area of all EU members and with coastal plains in the north and west and mountain ranges in the south-east (the Alps) and the south-west (the Pyrenees) the landscape in the mainland of France shows great diversity.

In France, four climate types can be found. A temperate maritime climate will be found in the west, near the coasts; a mountain climate prevails at the several mountainous regions like the Alps. A Mediterranean type of climate is found along the Mediterranean coast in the south, and a mid-latitude continental climate prevails in the interior of the country.

Table 21 – Water resource indicators of France

Environment Water Resources	Actual renewable water resources (total) km3	203.7
	Actual Renewable Water Resources (per capita) m3	3,342.6
	Internal renewable water resources	178.5
	Length of watercourses	160,000km

There are four main river systems which are the Loire, the Rhône, the Garonne and the Seine basin.

6.2.2 Socio-economic Assessment

A member of the G8 group of leading industrialised countries, it is ranked as the sixth largest economy in the world in 2005. According to the OECD, in 2004 France was the world's fifth-largest exporter and the fourth-largest importer of manufactured goods. In 2003, France was the 2nd-largest recipient of foreign direct investment among OECD countries at \$47 billion. In the same year, French companies invested \$57.3 billion outside of France, ranking France as the second most important outward direct investor in the OECD, behind the United States (\$173.8 billion), and ahead of the United Kingdom (\$55.3 billion).

Table 22 – Socio-economic indicators of France

Socio-economics ² Geography Land use Finance Social	Area	550,000 km ²
	Population	62.9 million
	Inhabitants per km ²	112
	Urbanisation	75,6%
	Currency	Euro
	Life expectancy at birth (Women, Men), 2003	84, 77.35
	Total labour force (000s), 2004	68.8%
	Government type	republic

² Source: The implementation of the EU Water Framework Directive in Austria: Status as of 2005 - Wolfgang Stalzer / Hellmut Fleckseder

Size of GDP (2006) National income per capita	Gross domestic product	1.350 billion Euro
	GDP per capita	30 266. 4289
	Volume index of GDP per capita	108.688
	Gross national income per capita	30 400.5714
Water consumption	Total gross water abstractions (million m ³)	33 163.95
	Per capita water abstractions (m ³ /capita)	560

In the 2005 edition of *OECD in Figures*, the OECD also noted that France leads the G7 countries in terms of productivity (measured as GDP per hour worked). Despite figures showing a higher productivity per hour worked than in the US, France's GDP per capita is significantly lower than the US GDP per capita, being in fact comparable to the GDP per capita of the other European countries, which is on average 30% below the US level. The reason for this is that a much smaller percentage of the French population is working compared to the US, which lowers the GDP per capita of France, despite its higher productivity. In fact, France has one of the lowest percentages of its population aged 15-64 years at work among the OECD countries.

Almost thirty years of massive unemployment in France, which has led to three consequences reducing the size of the working population: about 9% of the active population is without a job; students delay as long as possible their entry into labour market; and finally, the French government gives various incentives to workers to retire in their early 50s, though these are now receding.

With 79.1 million foreign tourists in 2006, France is ranked as the first tourist destination in the world, ahead of Spain (55.6 million in 2005) and the United States (49.4 million in 2005).

France is also the most energy independent Western country due to heavy investment in nuclear power, which also makes France the smallest producer of carbon dioxide among the seven most industrialised countries in the world. As a result of large investments in nuclear technology, most of the electricity produced in the country is generated by nuclear power plants (78.1% in 2006, up from only 8% in 1973, 24% in 1980, and 75% in 1990). Large tracts of fertile land, the application of modern technology, and EU subsidies have combined to make France the leading agricultural producer and exporter in Europe. Wheat, poultry, dairy, beef, and pork, as well as an internationally recognised foodstuff and wine industry are primary French agricultural exports. EU agriculture subsidies to France total almost \$14 billion.

The performance of policies for education and those for poverty and social exclusion are satisfactory or better in many areas, but cost-effectiveness can be improved and more focus on employment is needed. Policy has begun to prepare for the economic impact of population ageing, but there is no room to relax in seeking to contain fiscal costs and to increase employment among older workers.

Source OECD.

6.2.3 Legal, regulatory and management assessment

Water resource management in France is integrated, taking into account the ecosystem's physical, chemical and biological systems: surface and underground water, water quantity and quality and all uses. It uses decentralised management and local decision-making using water agencies, local authorities, industry and farmers. France also has consistent water use and land use policies.

The principle of water resources management at the level of river basins has been established by the Water Act of 1964. The Assemblée nationale adopted a Proposal for a Water Act which is to replace the Act of 1964 (and the important amendments made in 1992). In fact, in terms of current practice, the basic structure of water resources management remains unchanged.

The Ministry (MEDD) through its Water Directorate is responsible for water quality, resources and flood defence. On a regional basis, at the scale of hydrographic district the water basin agencies implement the public policies; they help the river basin committee, composed of water users and stakeholders in elaborating the Basin action plan and programme of measures, and they are collecting taxes paid by polluters and funding depollution efforts. On a local basis, public water supply and water treatment are operated by public or private companies as long-term concession.

France is administratively divided into six major watersheds. In each watershed there is a "Watershed Agency" which is responsible for tasks relating to water management. In mountainous regions there is an extensive net of torrents and alpine river systems. The water agencies undertake the priority actions and the financing of them. They are laid down in five year intervention programmes. They are prepared jointly by the boards of directors of the water agencies, adopted by the catchment area committees and approved by the Prime Minister. The water agencies distribute funds to local authorities, manufacturers and farmers who undertake to safeguard the water resources and quality. Calculated on the basis of pollution discharged and sampled quantities, these funds come from charges collected from water users.

At the local level Mayors are responsible for drinking water and sewerage services. With funds from the water agencies and often departmental assemblies, they control their management modes and investment decisions.

At the department level

The State's devolved services, placed under the prefect's authority, implement the water policy in its regulation and technical aspects. At the Area level, the area environmental offices (DIREN) make water policy implementation consistent.

The six catchment area prefects coordinate the actions of the different departments of the State in the field of water. In 1996 they approved the SDAGES, adopted by the catchment area committees.

6.2.4 IWRM Research Management:

In terms of research relating to water and WFD, several scientific institutions and financiers are involved. National consistency is insured by national priorities set by financiers. The national research agency (ANR) plays a major role by funding thematic research programmes, based on calls for proposals; for the year 2006, ANR had a funding capacity of 800m€. Among the main programmes on water coordinated by ANR 'vulnerability: climate and living environment' and Agriculture and Sustainable development' are the two related to WFD.

INSU is a funding agency managing some important research programmes related to water, in particular on continental and coastal ecospheres, called ECCO and EC2CO, which are coordinated and funded by several research institutions. The Ministry for ecology and sustainable development (MEDD) is also a research programme funder, providing funding to ensure that specific issues not addressed in other frameworks (institutes or ANR) are raised. Of the 20 research programmes financed by MEDD, 5 have direct relevance to the WFD (coastal waters, pesticides, ecotoxicology, waters and territories and endocrine disrupters).

BRGM, Cemagref, CIRAD, CNES, CNRS, IFREMER, INERIS, INRA, IRD and universities are involved as research institutes dedicated to specific areas where water can be important.

The procedure for research project selection is becoming more and more common to all French research funders. The government defines a national research policy within the framework of national decisions; Ministries which have a trust on scientific institutes will give direction on their priorities. Research programmes are based on calls for proposals, published within themes decided by each funder (ministries, ANR or institutes) and broadly circulated. For each programme funded by MEDD, a steering committee gathers the diversity of stakeholders and decision makers concerned with public water management policies, ensuring that calls for proposals are useful for their implementation of WFD and the programmes specific needs. A scientific committee is also set up for each programme to write the calls after the steering committees indications, to evaluate scientific excellence of proposals, and propose a list of best projects to the steering committee, who decides the final allocation of fundings. Once the research projects are achieved, the results are disseminated via seminars, synthesis and teaching documents.

Water Basin Agencies are major stakeholders for WFD related programmes and they are largely involved in the steering committees. Their current concerns for research deal mainly with economic tools for the programme of measures and approaches for establishing public participation.

MEDD also contributes to foresight activities (seminars, scenario exercises, workshops, with experts or with stakeholders) for various environmental policy topics (e.g. agriculture, environment, fisheries, biodiversity). The results of the foresight activities are used to identify long-term strategic

research needs and to discuss the relevance of research priorities. The ANR is also starting some foresight activities through collective workshops, as well as INSU. These foresight procedures will be helpful for policymakers to plan tomorrow's requirements, today for the research efforts necessary after the first cycle of the of the WFD.

6.2.5 Key research programmes

Project Name	Preserving the environment and creating productive rural areas
Acronym	Risq-Pest?
Project Description	The functioning of all types of farmed ecosystems – forests, natural, land, aquatic – the protection of resources and the management of rural areas are important research topics for INRA. Laying the foundation for ecoagriculture and for the development of competitive farmland, which strive to promote biodiversity and improve the environment, is a high-priority goal.
Start date	2006
End Date	2009
Research Themes	<ul style="list-style-type: none"> - To study the management and development of biodiversity through farming and forestry and to take action to protect aquatic environments; - To identify the options for adaptation to global changes: climate change and extreme events, new public health issues and transformation of farming practices and land use; - To reduce the use of fertiliser, toxic pesticide-related pollutants and to develop integrated protection practices; - To study the production systems of bio-energies, bio-molecules and plant biomaterials; - To analyse the spatial organisation of farms, ecosystems and landscapes; - To identify the interactions between ecological dynamics, human behaviour and public or collective decisions.
Research Management Process	All the proposals are evaluated by two members of the scientific committee (SC). The proposals are then discussed with all the members of the SC.
Agency administering	INRA
Funding Agency	Ministry of Higher Education and Research Ministry of Agriculture and Fisheries

Project Name	Consultation, decision, environment: experiences in participatory techniques in decision-making for the Environment
Acronym	CDE
Project Description	To include/understand the mechanisms and value of participatory techniques for decision-making for environment and sustainable development policies, to analyze and assess the experiments. To encourage and structure of research utilizing the various disciplines according to the needs for the environmental policies and durable development.
Start date	1999
Project funding	€1m
End Date	2005
Research Themes	<ul style="list-style-type: none"> - New practices and mechanisms for dialogue and decision-making - Evolution of the roles of the actors and their relations - How to take into account of the concerns and reactions of public concerned - Theory and the principles utilized <p style="text-align: center;">Water Related projects</p> <p>Concertation, décisions, obligations. Analyse des trajectoires des Plans d'Elimination des déchets et des SDAGE.</p> <p>Modèles et jeux de rôles pour l'aide à la négociation dans les processus de gestion de ressources renouvelables.</p> <p>Mobilisations et enjeux dans la gestion concertée du littoral méditerranéen.</p> <p>Démarche d'évaluation du rôle des technologies de l'information géographique pour la</p>

	concertation dans des projets environnementaux : développement d'une méthode générique et application à des études de cas. Nouvelles Technologies de l'Information et de la Communication et Environnement : le rôle des nouveaux intermédiaires dans l'élaboration et le suivi des décisions en matière d'environnement. Décisions et délibérations dans les projets de barrage-réservoir vis-à-vis de la régulation politique du domaine de l'eau.
Agency administering	Ministry of Ecology and Sustainable Development
Funding Agency	Ministry of Ecology and Sustainable Development

Project Name	National Programme for Continental Ecosphere (<i>Ecosphère Continentale et Côtière</i>)
Acronym	EC2CO
Project Description	Ecosphere continental process & modelling. The programme focuses on the various types of man-made change on continental and coastal ecosystems, including those resulting from the economic and social change. The projects will be evaluated in particular on multidiscipline problems. It is a condition of the utilization of the results of research towards the fields of management and the public policies.
End Date	Ongoing (latest call 2008)
Research Themes	<p style="text-align: center;">Themes 2006-2007</p> <ul style="list-style-type: none"> - Ecotoxicologie et dynamique des contaminants - Eaux et Territoires - Les interfaces côtières - Les matières organiques, compartiment et acteur essentiel des processus environnementaux - Impact du changement global (climatique et anthropique) sur les systèmes écologiques et sociaux (eaux, sols, écosystèmes) - Rôle de la biodiversité dans le fonctionnement des écosystèmes - Le chantier Méditerranée - Nouveaux outils, équipements et capteurs environnementaux du domaine SIC : recensement des besoins, établissement d'un cahier des charges - Les SIC et les observations depuis l'espace - Services d'Observations, ORE, ZA, Chantiers, Sites ateliers pour le domaine SIC - Systèmes et Milieux urbanisés
Research Management Process	Annual Calls for research published by INSU.
Agency administering	INSU (Institute national recherché de l'Univers)

Project Name	Environment, Ecology et Economics in Adour-Garonne basin
Acronym	ECOBAG
Project Description	<p>The Scientific Group ECOBAG (Environment, Ecology and Economy of the Adour-Garonne River Basin District) is a department of ADERA, that means that its administrative and financial management is ensured by ADERA. ECOBAG is gathering 7 universities from the cities of Bordeaux, Pau and Toulouse, and 3 national research institutions, namely the National Centre for Scientific Research (CNRS), the National Institute for Agronomy Research (INRA) and the public agricultural and environmental research institute (CEMAGREF).</p> <p>The main objectives of ECOBAG are to interface research activities with the social, economic, operational and political actors related to 'Water and Sustainable Development within the Adour-Garonne RBD'. Since 1995, ECOBAG has acquired the skill for :</p>

	<ul style="list-style-type: none"> - multi-institutional identification of the knowledge and tools requirements for integrated water management; - initialisation of interdisciplinary integrated research projects to provide the required knowledge and tools, and funds mobilisation for the corresponding research works; - the transfer of the project results to water stakeholders.
Start date	2002
Agency administering	ADERA

Project Name	Ecotoxicology and ecodynamics of contaminants
Acronym	ECODYN
Project Description	Study of interactions between contaminant and colloidal interfaces, and transfer and reactivity mechanisms at large scale; Integrated approach on contaminants behaviour at watersheds, continental and marine levels; Contaminants impacts on ecological systems functioning

Project Name	Impact of agricultural activities on soils and water and pollutants transfer to hydro-systems
Acronym	GESSOL2
Project Description	<p>GESSOL1 was from 1994 to 2003 and produced 17 projects under the following themes; 1. The chemical quality of the grounds: pollution of the grounds by the elements traces; 2. Monitoring of the grounds on the level of basins slopes and the search for quality standards of the grounds (physical chemical or biological); 3. The quality of water: streaming, erosion and transfers; 4. Effects of husbandries on of the grounds; 5. Quality of the grounds and quality of the air (effect of greenhouse): organic matter and emission of N2O; 6. Waste recycling and quality of the grounds.</p> <p>Gessol2 is on the following issues:</p> <p>Impact of agricultural activities on soils and water and pollutants transfer to hydro-systems - Soil quality / Water and dissolved matter transfer / Agricultural practices</p>
Start date	2004
End Date	2007
Research Themes	<p>The programme has two main themes :</p> <ul style="list-style-type: none"> - The Impact of agriculture and Silviculture on the physical, chemical and biological status of soil - The transfer of pollutants in Groundwater <p>The two topics are not independent and combine to the overall objective of soil and water management.</p> <p>Within these themes there are two sub-themes:</p> <ul style="list-style-type: none"> - to improve the farming practices impact on soil towards sustainable management - to influence agricultural and Silviculture practice towards reducing impact on the quality of surface and groundwater
Agency administering	Ministry for Ecology and Sustainable Development
Funding Agency	Ministry for Ecology and Sustainable Development

Project Name	Sustainable management of coastal zone
Acronym	LITEAU
Project Description	<p>Complementary to the PNEC (National program on coastal environment), it aims to improve the knowledge of coastal areas and development of tools for the coastal zone managers</p> <p>Liteau : 1998 – 2002</p>

	Liteau II : 2003 – 2006 Liteau III: 2007 -
Start date	2003
End Date	2007
Research Themes	<ul style="list-style-type: none"> - Restoration of heavily modified sites and environmental engineering - Marine Protected Areas : délimitation des espaces à enjeux patrimoniaux et effet réserve - Definition and criteria for Good Ecological Status - Vulnerability, adaptation and collective management of risk in coastal zone - ICZM : concept and implementation
Publication	http://www.liteau.ecologie.gouv.fr/index.php
Research Management Process	The orientation committee agree the direction of the programme based on the evidence of the scientific Council.
Agency administering	Ministry for Ecology and Sustainable Development
Funding Agency	Ministry for Ecology and Sustainable Development

Project Name	Functioning and dynamics of continental biosphere
Acronym	PNBC
Project Description	The impact of human activities on ecosystems, countries and the continental biosphere requires a new organisation of society in terms of economics, politics and legal systems in order to be able to manage the causes. The research covers all areas of environment – terrestrial, aquatic, air and coastal. It investigated and proposed new organisational levels from covering all scales within the hierarchy from individuals to ecosystems and countries and integrating them all.
Research Themes	The following areas were considered as research themes: <ul style="list-style-type: none"> - connecting and modelling biochemical cycles in ecosystems - Trophic networks and the dynamics of energy and nutrients - Quantification of physical and biological change in ecosystems - evaluation of human impacts on ecosystems
Publication	An overview can be found at the following website; http://www.insu.cnrs.fr/r197,pnbc.html
Agency administering	CNRS
Funding Agency	Ministry for Research and Education?

Project Name	National Coastal Environment Programme
Acronym	PNEC
Project Description	PNEC was created in 1999 to conduct research into coastal issues. It was a multi-disciplinary and multi-agency programme. The areas where the research was undertaken were: The Seine basin and the areas next to the Channel. Gulf of Gascogne Gulf of Lion Mediterranean Lagoons Continental shelf of Guyana Noumea Lagoon, New Calendonia
Start date	1999
End Date	2002

Research Themes	<ol style="list-style-type: none"> 1. Biochemical cycles in the temperate and Tropical regions 2. Population Dynamics : hydro-dynamics structures and biological dynamics 3. phosphorescent algae - toxic or damaging 4. Methods for analysing spatio-temporal variability 5. Micro-organisms and the coastal environment 6. The dynamics of Economics 7. Sediment Dynamics
Research Management Process	They are transverse research projects obeying precise objectives. They are flexible, open, and modifiable on the short term. They can be dependent or not on one or more building sites to which they have vocation to be applied in the long term. The requests for support are carried out annually, and the programs in progress can each time present significant modifications.
Agency administering	Ministry for Ecology and sustainable development
Funding Agency	Ministry for Ecology and sustainable development

Project Name	National Program for Ecotoxicology research
Acronym	PNETOX II
Project Description	provide scientific data to public bodies and decision maker in the field of ecotoxicology (development and effects of the pollutants on the environment). Strategic research on effect of pollutants, reliable data for ecotoxicology risk assessment. (PNETOX I was from 1996-1999)
Start date	2000
End Date	2004
Research Themes	<ul style="list-style-type: none"> - endocrine disruptors, - Metals : the objective is to rely on actual knowledge with the results of the national monitoring programme (RNB...) or to complete a global analysis ;to start out with the Global analysis, It should create a series of identification keys that can calculate geochemical impacts, in particular on Biodiversity, - Persistent Organic Pollutants POP (Polluants Organiques Persistants) et PBT (Persistent, Bioaccumulative and Toxic) ; - Veterinary products, e.g. biocides and medicines, research into the long-term side-effects and products, - Substances used in Agriculture (Fertilizers, Genetically Modified Organisms)
Research Management Process	Proposals were chosen on their integrative quality and innovation. The knowledge transfer towards the standardized methods and for standardization was also valued highly. The proposals were analyzed by: - the scientific Council, which evaluated their scientific quality, structure and innovating character. The Committee of orientation, selected the projects, according to the established priorities of research.
Agency administering	MEDAD
Funding Agency	MEDAD

Project Name	National programme for research in hydrology
Acronym	PNRH
Project Description	<p>There are many sources of conflict for water; the demographic trends, the possibility of climatic changes, the increase in local and diffuse pollution, the multiplicity of the actors concerned with its many uses.</p> <p>With these risks there is a need for providing to the political and socio-economic actors the scientific information for decision-making. From this need was developed the PNRH, to develop an integrated approach to the study of the water cycle at a large scale including the whole of its components and of associated coupled flows (energy, aqueous solutions, gas, sediments). Groundwater would also be considered along with, heterogeneous polyphase medium, like a biogeochemical engine with the limited capacities of retention and degradation of polluting substances, and like an interface hydraulically activates with subsoil waters, the continental biosphere and the atmosphere.</p>
Start date	1997
Research Themes	PNRH is focused on three main areas :

Agency administering	- The hydrodynamics and modelling of the water cycle
	- Quantification of water flows
	- Development of methodologies and metrics
Funding Agency	CNRS
	Ministry for Ecology and Sustainable Development

Project Name	National Research Plan on Wetlands
Acronym	PNRZH
Project Description	Following a significant reduction in the quality and quantity of wetlands in France the programme was set up to: <ul style="list-style-type: none"> - Develop and strengthen management tools and evaluation of wetlands - Ensure the public and political support for wetlands - recreate former wetlands - Disseminate information and raise awareness of Wetlands.
Start date	1995
End Date	2001?
Research Themes	To achieve the above objectives the programme was focused around the following axes: <ul style="list-style-type: none"> - The structure and functions of wetlands - the ecological role and economic importance of wetlands - Interactions between society and nature - Methodologies for conservation and restoration of wetlands
Agency administering	MEDAD
Funding Agency	MEDAD

Project Name	Risk Decision and territory - Evaluation and risk analysis (natural and technical)
Acronym	RDT
Project Description	The objectives of the RDT programme are to; <ul style="list-style-type: none"> - Create a network on territory within the existing teams of research, to answer scientific questions related to the natural or industrial risks in the field of the natural and social sciences to improve knowledge. This will also include better utilisation of current research and create places of capitalization of knowledge and to support the finalization of research. - Answer the questions raised by the risk-managers, providing decision-support tools; to better associate the civil society with risk management; - establish national syntheses starting from the results of research respecting the local contexts and to study the connections between regional decisions and national decisions; - reinforce the network of French experts to help with the decisions at the national and international level;
Start date	2003
Research Themes	Understanding natural hazards and industrial accidents and the economical impacts on the region? Understanding Vulnerability Evaluating and hierarchy of risk Reducing Risks Analyse methods of engaging stakeholders in decisions Emergency planning Post event analysis Feedback from experience and holding it in memory?

	Analyse methods for engaging civil society in managing risks
Research Management Process	The orientation committee is managed by MEDAD and the scientific council is managed by CEMAGREF.
Agency administering	MEDAD
Funding Agency	MEDAD

Project Name	Flood Risks - Flood Risk Assessment
Acronym	RIO
Project Description	The aims of the programme were to take account of the vulnerability of sanitation to flooding, risks to human habitation, infrastructure for water supply and treatment and monitoring and flood warning.
Start date	1997
Project funding	2.5m€
End Date	2005
Research Themes	In total 33 research projects were funded by this programme. the themes were; <ul style="list-style-type: none"> • Predicting extreme events ; • Understanding hazards and their change due to natural and anthropomorphic impacts • Economic approach to damage ; • Prevention policy ; • Crisis Management including surveillance, warning and post-event (including water supply and sanitation).
Research Management Process	stakeholders: in seminars, synthesis, Teaching cards... during the different steps of the projects A scientific committee: Analyses the projects and propose a grading of projects A orientation council: Selects financed projects to the partners (Ministries of Ecology and Sustainable development-MEDD, Equipment, Interior...)
Agency administering	MEDAD
Funding Agency	MEDAD

Project Name	Research and innovation network for water
Acronym	RITEAU
Project Description	<ul style="list-style-type: none"> - Predict the socio-economic demands in the medium to long term - identify the technological problems motivated by the market - Create a competency network with industry, by inviting organisations into collective research projects - Develop a centre for expertise in validation and dissemination of research in support of public policy and implementation - Encourage knowledge transfer to the market - Facilitate? the scientific and technical community <p>Within the programme there are three themes :</p> <ul style="list-style-type: none"> - Instrumentation, monitoring and measurement? - Exploitation et management of water - Environmental Contamination

Start date	2000
Research Themes	<p>Exploitation and Management of Water</p> <p>Objectives</p> <p>décliner en verrous technologiques les enjeux du marché comme les attentes des consommateurs en matière de qualité, d'impacts environnementaux et de santé, tout au long des filières de traitement.</p> <p>assurer la gestion quantitative des ressources et sa pérennisation.</p> <p>encourager les développements technologiques, y compris le recours aux fonctionnalités des hydrosystèmes naturels ou aménagés, pour renforcer la protection des sites particulièrement exposés ou vulnérables (sites naturels et industriels, zones habitées, valeurs patrimoniales) aux risques naturels, comme les inondations.</p> <p>Champs proposés :</p> <p>repérage, surveillance et régulation de la ressource primaire en fonction des besoins</p> <ul style="list-style-type: none"> · prospection et évaluation des ressources (caractérisation et suivi des nappes et des bassins versants) · accès à la ressource · maîtrise des pompages · stockage et distribution <p>protection de la qualité et gestion économe des flux</p> <ul style="list-style-type: none"> · protection des sites d'exploitation et des réseaux · maîtrise des prélèvements et des rejets · épuration des effluents et assainissement <p>recours par le génie écologique aux fonctionnalités d'hydrosystèmes naturels ou aménagés, en examinant leurs capacités régulatrices et épuratrices.</p> <p>les technologies de prévision, de protection et de réhabilitation liées aux risques d'inondation.</p> <p>animer la communauté scientifique et technique</p>
Agency administering	BRGM, CEMAGREF
Funding Agency	<ul style="list-style-type: none"> - le Ministère de l'Economie, des Finances et de l'Industrie - - le Ministère de la Recherche - le Ministère de l'Aménagement du Territoire et de l'Environnement

Project Name	Economical Sciences for environment
Acronym	S3E
Project Description	<p>The objective of the programme is to contribute to the implementation of economic instruments in environmental policies:</p> <ul style="list-style-type: none"> - Economic valorisation of environmental good or damages to environmental policies - Environment, economic growth and sustainable development - Economic regulations <p>Le Ministère de l'Écologie et du Développement Durable (MEDD) souhaite que la recherche en économie de l'environnement puisse éclairer ses travaux d'évaluation économique des politiques environnementales (essentiellement eau, déchets, nature, risques industriels, risques naturels) et d'intégration de l'environnement dans les politiques sectorielles (essentiellement transports, énergie, agriculture).</p>
Start date	2003
Project funding	€900,000

Research Themes	<p>14 projects have been funded since 2003 within six thematics in the programme:</p> <ul style="list-style-type: none"> - Landscape qualifying for economical valuation - implicit value of environmental wealth for transport infrastructure choice - charm./amenity in urban areas - environmental information given by firms to markets - physical and behavioural determinants of local public utilities prices - regulation of public utility in imperfect information - - Valorisation des aménités et coûts des dommages à l'environnement. - Comportement des agents et impact des instruments économiques (dont la régulation contractuelle). - Comptes, statistiques, indicateurs et information environnementale publique <ul style="list-style-type: none"> • Un rapport de recherches sur le différentiel de prix dans les services d'eau montre que les municipalités choisissent la délégation de service public d'eau potable lorsque la situation de ce réseau occasionne des frais importants, ce qui fait paraître cette délégation plus coûteuse que la gestion directe. Le vrai problème serait plutôt à chercher dans la situation d'un monopole géographique qui diminue la capacité des communes à choisir un délégataire. Ces résultats peuvent permettre d'objectiver le débat sur la délégation des services de l'eau en France. • - Gestion des pollutions diffuses agricoles : un projet expérimente la faisabilité, l'acceptabilité et l'efficacité d'un système spécifique de taxation et de contrôle pour inciter à l'adoption de pratiques agricoles permettant la préservation de la qualité de l'eau, et atteindre ainsi une meilleure gestion des pollutions diffuses agricoles sur la nappe d'Alsace. • Les instruments économiques (les taxes par exemple) sont des instruments essentiels pour infléchir le développement durable de nos sociétés vers plus de durabilité. Par exemple, l'un des projets financés cherche à établir quelle est la meilleure combinaison entre régulation ex ante (par exemple par une taxation incitative à caractère préventif) et un régime de responsabilité ex post (avec par exemple des sanctions financières) pour inciter les entreprises à faire des efforts de prévention des risques industriels.
Agency administering	MEDAD
Funding Agency	MEDAD

Project Name	Pilot study of RBMP on the Seine
Acronym	PIREN Seine
Project Description	<p>The scientific objective of the PIREN-Seine program is to develop in a coordinated and interdisciplinary way overall knowledge of the physical, biological and socio-economic processes necessary for sustainable management of the hydrological resource of Seine.</p> <p>The national interdisciplinary Program PIREN SEINE (with CNRS since 1989) on the Seine River and its tributaries aims at understanding the ecological functioning of the Seine and also Marne. A coherent "tool box" of models, able to dialog with each other, has been established (SENEQUE, MODCOU, STICS).</p> <p>The PIREN programs are interdisciplinary environmental research programs. Co-financed by the <i>Agence de l'eau Seine-Normandie</i> (Seine-Normandy Water Agency) and the majority of private and public organizations involved in managing the water resources of the basin, such as the CNRS, PIREN-Seine is a research group bringing together teams from the CNRS, CEMAGREF (<i>Centre national du machinisme agricole, du génie rural, des eaux et des forêts</i> — National Center for Agricultural Mechanization, Rural Engineering, Water and Forests), INRA, CEREVER (<i>Centre d'enseignement et de recherche: eau, ville, environnement</i> — Center for Education and Research: Water, Town, Environment) at the ENGREF (<i>École nationale du génie rural des eaux et forêts</i> — National College for Water and Forest Rural Engineering), and several universities.</p>
Start date	1989
Research Themes	<p>The PIREN-Seine's priorities are:</p> <ul style="list-style-type: none"> • treating domestic pollution. The Seine receives waste water from more than fifteen million inhabitants, of whom ten million live in the Paris

	<p>region;</p> <ul style="list-style-type: none"> • predicting and reducing the different types of pollution from agriculture. In this precise case, the SENEQUE model made it possible to model the changes in the Seine's nitrate content as it enters Paris; • managing aquatic plant growth that may be a detrimental to water quality.
<p>Research Management Process</p>	<p>This is a multi-disciplinary and multi-agency programme. Before implementing water management plans, decision-makers must examine the problem from every possible angle. Thanks to a multidisciplinary approach, geologists, hydrologists, geographers, biologists, chemists, sociologists, etc., and engineers of the PIREN-Seine can provide sophisticated scientific expertise regarding the Seine and its basin.</p>
<p>Agency administering</p>	<p>CNRS</p>
<p>Funding Agency</p>	<p>various</p>

6.3 Germany - IWRM Context

6.3.1 Water Resource Assessment

Germany has a varied terrain ranging from low coastal flats along the North and Baltic Seas to a central area of rolling hills and river valleys, to forested mountains and the Alps region in the south. Germany has an extensive river network, ranging from small creeks and torrents in the Alps to big rivers and streams in the low-land and deltas. The main river systems in Germany are the Rhine, Danube, Elbe, Meus, Weser, Oder, Ems, Eider, and the Schlei/Trave.

Table 23 – Water resource indicators of Germany

Environment Water Resources [source: FAO Aquastat]	Internal renewable water resource total (km3)	107
	Internal renewable water resource per capita	1305
	Annual natural renewable water resource (includes flow from other countries)	188
	Mean total annual precipitations	699,9mm[4]
	Lowest annual mean	525mm[5]
	Highest annual mean	1000mm[6]
	Annual volume of useable water (precipitation and river discharges minus evaporation)	16,8%[7]
	Length of watercourses	8.279 km ²

6.3.2 Socio-economic assessment

Germany has the largest economy in Europe and the third largest economy in the world, behind the United States and Japan. It is ranked fifth in the world in terms of purchasing power parity. The export of goods is an essential part of the German economy and one of the main factors of its wealth.

Table 24 – Socio-economic indicators of Germany

Source: OECD 2005 & UBA³

Socio-economics Geography Land use Social	Area	35.704.964 ha (2004)
	Population	82.251.000[2] (31. Juli 2007)
	Inhabitants per km2	231 Einwohner / km ²
	Urbanisation	25,3Mio=30% (2004)
	Mountainous	
	Pasture	4.881,7 ha
	Arable	11.866,1 ha
	Forests (2004)	10.648.822 ha (2004)

³ <http://www.env-it.de/umweltdaten>

	Water (2004)	827.903 ha (2004)
	Currency	Euro
	Life expectancy at birth (Women, Men)	Women: 80 / Men: 74
	Total labour force, 2004	40,26 Mio.
	Government type	parliamentary republic
Size of GDP 	Gross domestic product 	2.537.9606
	GDP per capita 	30.776.5883
	Volume index of GDP per capita 	105.7135
National income per capita 	Gross national income per capita 	29.853.0506
Water consumption 	Total gross water abstractions 	35.556.944
	Per capita water abstractions 	430

According to the World Trade Organization, Germany is the world's top exporter with \$1.133 trillion exported, from the beginning of 2006 (Germany's exports to other Eurozone countries are included in this total). It has a large trade surplus (165 billion euros in 2006).⁴ In the service sector, Germany ranks second behind the United States. Most of the country's exports are in engineering, especially in automobiles, machinery, metals, and chemical goods. In terms of total capacity to generate electricity from wind power, Germany is first in the world and it is also the main exporter of wind turbines.

Germans continue to be concerned about a relatively high level of unemployment, especially in the former East German states where unemployment tops 18%. In spite of its extremely good performance in international trade, domestic demand has stalled for many years because of stagnating wages and consumer insecurity. Germany's government runs a restrictive fiscal policy and has cut numerous regular jobs in the public sector. But while regular employment in the public sector shrank, "irregular" government employment such as "one euro" jobs (temporary low-wage positions), government supported self-employment, and job training increased. The national economy has nonetheless shown signs of improvement in recent years, the economics magazine *Handelsblatt* declaring it one of the most competitive in the Eurozone. Economists for the Institute for Economic Research in Berlin expect Germany's economic growth to increase consistently over the next two years.

6.3.3 Legal, regulatory and management assessment

The Federal Ministry for Environment, Nature Protection and Nuclear Safety deals with basic questions of water management through the Federal Water Act. Implementation of water management is devolved through the Federal States (Länder). The working group of Federal States then discusses issues and formulates solutions. Research in this field is funded and promoted via the Federal Ministries and their Project Management Agencies listed. Project funding is also provided by private foundations like Deutsche Bundesstiftung Umwelt (DBU = German Federal Foundation for the Environment), Robert-Bosch-Foundation or Volkswagen Foundation.

Priorities:

⁴ Source :Wikipedia

- Determination of MEP/GEP
- Exemptions
- Cost effectiveness of measures
- In general: Consolidation of the new developed methodologies in biological assessment in particular with respect to adaptations to the ongoing inter-calibration process (long-termed)
- Technical and scientific steering of the inter-calibration process
- Further development of the assessment methodology of natural and artificial lakes with macrophytes and phytobenthos
- Further development of the assessment methodology of phytoplankton in dams and quarry ponds

The Federal Ministry for the environment, nature protection and nuclear safety deals with the basic questions of water resources management as well as with trans-boundary cooperation in the field of water resource management as part of environmental policy. The Ministry is responsible for the federal water act. The implementation of water resources management regulations is exclusively a matter for the Lander and the municipalities.

90% of public expenditure in R&D are spent by the Federal Ministry of Education and Research (of which 66%), Ministry of Economics and Labour and the Ministry of Defence (33% between them). The research management and implementation is delegated to six autonomous organisations which receive funding jointly from Federal State and Landers. There is a clear distinction between research and funding organisations.

6.3.4 Key research programmes

The Federal Ministry for the Environment, Nature Protection and Nuclear Safety promotes research on basic questions of water resources management as well as trans-boundary cooperation in the field of water resource management as part of environmental policy and funds. The implementation of water resources management regulations is exclusively a matter for the Länder. Corresponding research is funded within the programme “Water, Soil & Waste” by the LAWA (working group of Federal States on water issues), with a focus on WFD. 90% of the public expense in R&D, however, is by the Federal Ministries of Education and Research (2/3), Economics and Technology and Environment, Nature Protection & Nuclear Safety. Most research funding is spent through a system of competition via calls for proposals, in which any public or private organisation can take part. **Long-term research** is mostly undertaken by the Deutsche Forschungsgemeinschaft (DFG, fundamental questions) and the Federal Ministry of Education and Research (BMBF, applied research). All public funding bodies are advised and supported by expert boards or scientific councils and evaluate research proposals by external and internal experts or consultants.

Framework Programme Name	Research for Sustainability
Acronym Programme	FONA
Owner	Federal Ministry of Education and Research

Programme Description	Landscape and nature, water, environment, consumption, mobility, problem perception and social causes, social behavioural effects, control in problem situations, sustainable development.
Start date	01/01/2004
Project funding (projects finished, running or approved, status Jan. 2008)	656.905.454,28 € (this sum refers for the whole framework programme that involves a lot more of themes and respective programmes)
End Date	EC-Notification ends Dec 2009
Dissemination details	dissemination through papers, conferences, and various publications (dependent on the projects)
Project ID	3
Framework Programme Name	FONA 2 (under preparation)
Evaluation	- Meeting of evaluators from science, authorities, associations and Federal States - Evaluation by given criteria; discussion of the proposals and recommendation by the evaluators
Research Management Process	Before the call of proposals was published the content of the research focal point was discussed and agreed by several stakeholders (Federal States, Water Associations, Federal Agencies, Ministries ...)
Dissemination method	stakeholder and scientific dissemination
Start date	Scheduled 01/01/2010

FONA focal point (sub programme)	Flusseinzugsgebiete - Research for the Environment - River Basin Management
Acronym	FLUSSEIN
Project Description	Expected results: - Tools for integrated water management - Recommendation for authorities - Scientific knowledge
Start date	01/01/2000
Project funding	13.50
End Date	01/01/2005
Research Themes	stakeholder and scientific dissemination - Meeting of evaluators from science, authorities, associations and Federal States - Evaluation by given criteria; discussion of the proposals and recommendation by the evaluators
Publication	
Research Management Process	Before the call of proposals was published the content of the research focal point was discussed and agreed by several stakeholders (Federal States, Water Associations, Federal Agencies, Ministries ...)
Start date	01/01/2000
Project funding	13.50
End Date	01/01/2005

Project Name	Global Change in the Hydrological Cycle
Acronym	GLOWA
Project Description	GLOWA aims to create a basis for the development of innovative technologies and cost-effective services for the sustainable, far-sighted management of water resources. It will develop simulation tools and instruments which will allow regional management of

	resources while taking into account global environmental changes and socio-economic conditions http://www.glowa.org/eng/glowa_eng/glowa_eng.php
Start date	2000
End Date	Running programme
Research Themes	The main objective is to focus on the problem of water availability, taking into account : <ul style="list-style-type: none"> - The continuous growth of the world population - The excessive use of water resources - Global environmental changes <p>There are a number of basins within this programme: Elbe, Danube and Volta (West Africa) looking at the following aspects in an integrated and multi-disciplinary manner,</p> <ul style="list-style-type: none"> - Natural variability of precipitation, variations caused by the human activities and their effect on the hydrological cycle - Interactions between the hydrological cycle, the biosphere and land use - Water availability and conflicting water uses
Agency administering	German Centre for Air and Astronautics (Deutsches Zentrum für Luft und Raumfahrt)
Funding Agency	BMBF

Project Name	Integrated Water Resource Management
Acronym	IWRM
Project Description	To prevent further deterioration and to protect and to enhance the status of aquatic systems and with regard to their water needs, terrestrial ecosystems and wetlands directly depending on the aquatic ecosystems To protect water resources To contribute to the provision of the sufficient supply of good quality surface and groundwater for sustainable, balanced and equitable water use.
Start date	2005
End Date	Running programme
Research Themes	Main themes: Biological, chemical, physical and hydro-morphological assessment of water bodies Balance of water and substances Socio-economic aspects Development of management tools
Agency administering	Project Management Centre Juelich
Funding Agency	Federal Ministry for Education and Research

Project Name	Biodiversity and Global change
Acronym	BIOLOG
Project Description	The objective of the BILOG research program is to arrive at a better understanding of the role of biological diversity in ecosystems. Which species live in a particular ecosystem? The species in an ecosystem are classified along the lines of an inventory. For it is only by classifying biological diversity that it becomes possible to assess and appropriately evaluate the threat. How do the species function within the ecosystem? This question is used as a basis for examining the interdependencies and correlations existing between the individual species within an ecosystem. How does the ecosystem evolve? The purpose of this question is to reveal how changeable an ecosystem is and to identify the factors that influence its development. When is an ecosystem stable? Which factors render it unstable? How can the ecosystem be used on a sustainable basis? Questions 1–3 create the basis for devising strategies under which even sensitive ecosystems can be used in a sustainable manner without destroying their biological diversity.
Start date	1999
End Date	2009
Publication	http://pt-uf.pt-dlr.de/de/158.php

Admin agency	Projectträger im DLR
Funding Agency	Ministry of Education and Research
Programme Name	“Water, Soil & Waste”
Programme Owner	LAWA (working group of Federal States on water issues)
Programme Description	The aim of this programme is to standardize the execution/implementation of laws pertaining to water and ground-protection in the Federal states From the land financing program both research and development projects will be supported as well as the production of relevant standards, guidelines and terms of reference.
Start date	2001
Project funding	
End Date	running
Dissemination details	dissemination through stakeholders, conferences, and various publications (dependent on the projects)
Evaluation	Evaluation by given criteria; by experts of the LAWA and associated institutions
Research Management Process	Approval and Management of projects will be at the Ministry of Agriculture, Environment & Consumer Protection Mecklenburg-Vorpommern
Dissemination method	stakeholder dissemination

6.4 Netherlands

6.4.1 Water Resources Assessment

It is a very low-lying and flat country (delta country) bordered by the North Sea in the north and north-west. The country has a moderate maritime climate. About half of its surface area is less than 1 metre above sea level, and large parts of it are actually below the level of the sea and of the large rivers that crisscross the Netherlands. An extensive range of dikes and dunes protects these areas from flooding. Numerous massive pumping stations (e.g. windmills) keep the ground water level in check. A substantial part of the Netherlands has been reclaimed from the sea (polders).

Table 25. Water resource indicators for Netherlands

Environment	Internal renewable water resource total (km3)	11
Water Resources	Internal renewable water resource per capita	688
	Annual natural renewable water resource (includes flow from other countries)	91

Four important international river systems are known: Rhine, Waal, Scheldt, and Meuse. The country is hydrologically divided into 53 dike ring systems (which means that a geographical unit is bound by a flood protection system) which are also separate administrative units under the Water Embankment Act. The "IJssel" lake in the north is mainly fed by the river IJssel.

6.4.2 Socio-economic Assessment

The Netherlands has the 16th largest economy in the world, and ranks 10th in GDP (nominal) per capita. Between 1998 and 2000 annual economic growth (GDP) averaged nearly 4%, well above the European average. Growth slowed considerably in 2001-05 due to the global economic slowdown, but the first quarter of 2006 showed promising growth of 2.6%. Inflation is 1.3% and is expected to stay low at around 1.5% in the coming years. Unemployment is at 5.5% of the labour force. By Eurostat standards however, unemployment in the Netherlands is at only 3.3% - the lowest rate of all European Union member states. The Netherlands also has a relatively low GINI coefficient of 0.326. A highly mechanised agricultural sector employs no more than 4% of the labour force but provides large surpluses for the food-processing industry and for exports. The Dutch rank third worldwide in value of agricultural exports, behind the United States and France, with exports earning \$55 billion annually. A significant portion of Dutch agricultural exports are derived from fresh-cut plants, flowers, and bulbs, with the Netherlands exporting two-thirds of the world's total. The Netherlands also exports a quarter of all world tomatoes, and one-third of the world's exports of peppers and cucumbers. (Source: Wikipedia)

Table 26. Socio-economic indicators for Netherlands⁵

Socio-economics Geography Land use Social	Area (wikipedia)	41,526 sq km
	Population	16,570,613
	Inhabitants per km2	399
	Arable	21.96%
	Permanent crop	0.77%
	other	77.27%
	Currency	Euro
	Life expectancy at birth (Women, Men), (2007 est)	81.82, 76.52
	Total labour force (000s), 2006	7,490
	Government type	Constitutional monarchy
Size of GDP	Gross domestic product	573.0202
	GDP per capita	35 120.1408
	Volume index of GDP per capita	117.9159
National income per capita	Gross national income per capita	35 435.2626
Water consumption	Total gross water abstractions	8 937.33
	Per capita water abstractions	560

6.4.3 Legal, regulatory and management assessment

Water management is very decentralised. At the national level environmental management is led by the Ministry of spatial planning, housing and the environment. Water management is undertaken by the Ministry of transport, public works and water management. Within the provinces the responsibility for water management is devolved to the Watershappen and municipalities. In the majority of cases, water supply provision is now delegated to municipally-owned PLCs, which now cover an average of 64 municipalities. The Rijkswaterstaat, is the national government organisation responsible for supervision of the system, and for strategic policy. The provinces are responsible for groundwater management, and also supervise the work and finances of the water boards. Water boards are now responsible for water-related land use planning, nature conservation and environmental protection and related tasks, including wastewater treatment plants (and sewerage networks connecting the treatment plants and the municipally-run sewerage networks) – but not drinking water supply.

⁵ (Source: OECD & CIA World Factbook)

Project Name	Climate changes spatial planning
Acronym	KvR
Project Description	BSiK-KvR ME1-Project: <ul style="list-style-type: none"> - availability of a monitoring system for climate change - enforcement of knowledge infrastructure, in particular gamma and beta research aimed at fundamental renewal and application
Start date	2003
Project funding	100,271.00
End Date	2010
Publication	Internet, conferences, demonstration projects, education.

Project Name	National Study on Climate change - Water
Acronym	CC-Water
Project Description	The theme is aimed at the problem of a large scale influences of humanity on the environment. With regard to freshwater the problems involve, <i>inter-alia</i> impacts on the water cycle, water quality and societal aspects of water. Key words: Climate change, Water demand, Water availability, Water quality, Vulnerability, Adaptation measures, Sustainable water management
Research Themes	The research programme has a matrix scheme where three themes of research all involve three 'threads'. The complimentary themes are: <ul style="list-style-type: none"> - Water and the earth system - Global change and aquatic ecosystems - water and society The following three threads weave through all of the above themes; <ul style="list-style-type: none"> - Diversity, heterogeneity and variability - non-linearity, thresholds and boundaries - Vulnerability, resilience and adaptation
Admin agency	NWO – (ALW) and WOTRO

Project Name	Delft Cluster / BSiK framework
Acronym	DC
Project Description	The project aims to develop sustainable spatial planning and development of densely populated delta areas. It will combine knowledge and experience in civil and hydraulic engineering projects. Infrastructure will be more sustainable and integrated into spatial planning projects. the programme will produce a coherent set of Delft systems.
Start date	2003
Project funding	168,600.00
End Date	2010
Research Themes	<p>6 sub-projects</p> <p>The Delft Cluster programme is divided into 6 sub-projects (also known as key themes) that jointly reflect questions from the sector. These six key themes are as follows:</p> <ol style="list-style-type: none"> 1. Managed utilisation of the subsoil 2. Low-maintenance infrastructure 3. Technology and decision-making 4. High water and flood risks 5. Spatial planning with water 6. Urban water management. <p>This division of the programme is essential to ensure maximum coordination with the sector and the issues that arise there. Each of the themes incorporates part of the sector, which in turn participates, is included in discussions, and influences the programme contents. In themes 4 and 5, there is considerable overlap between</p>

	sector issues, and the division has been selected on the basis of programme manageability. To maintain focus and to guide in a coherent way, the DC programme has a maximum of 4 subsidiary-projects per theme
Publication	an E-portal is planned to be fully operational in 2007 www.delftcluster.nl . Furthermore dissemination takes place through reports and conferences. papers / articles, books and publications in journals
Evaluation	
Research Management Process	The business proposal of the second Delft Cluster programme bases the size of the programme on a BSIK contribution of 70 million euros. A further 22 million euros was awarded following evaluation of the programme. Drawing on considerations and comments from this evaluation, including from the Advisory Committee, KNAW and CPB, the decision was taken to proceed further with the two topics that had been judged most highly ("water" and "dry infrastructure"). Each of these topics has been divided into three underlying themes in the current programme.
Funding Agency	The scale of the Delft Cluster-BSIK programme is approximately 44 million euros, of which 20.5 million euros is from BSIK, 19 million euros is the institutes' own contributions, and 4.5 million euros comes from trade and industry. Associated with the DC-BSIK programme, activities also take place totalling some 17 million euros. Although these activities are not part of the DC-BSIK programme, they are steered and implemented by Delft Cluster. The contents will also be presented in reports in this context.
	BSIK

Project Name	Social Scientific Research into Nature and the Environment
Acronym	GaMON1
Project Description	The programme aims to describe, understand and manage societal issues in the context of the environment. The objectives are to: (1) stimulate development and utilization of social sciences (2) reinforce the embedding of social sciences in applied research areas (3) reinforce fruitful communication among researchers of various disciplines.
Start date	2003
End Date	2006
Research Themes	There are 5 themes of research: <ul style="list-style-type: none"> - Landscape and nature - living and employment environment - integral water management - domestic consumption - personal mobility
Admin agency	NWO

Project Name	Dutch expertise network for multiple space use innovation in urban and regional land use & development
Acronym	HabiForum
Project Description	The three objectives of the programme are: <ol style="list-style-type: none"> 1. Achieve spatial synergy in spatial networks 2. Achieve spatial synergy between scale levels 3. realize a better spatial quality <p>Utilization of knowledge available from the creation of knowledge and from the scientific research, establish lacking knowledge based on demand- driven research, develop methods on contents and process, establishment of capabilities and competences</p>
Start date	2004
Project funding	€60m
End Date	2009
Research Themes	Within the network there are 8 clusters and water can be found in clusters 2 and 3. <ul style="list-style-type: none"> - Green/blue network – coordinating and design guidelines for achieving

	sustainable nature and recreation networks
	- Multiple spatial development
Publication	www.habiforum.nl & workshops, conferences, pilot projects, books and folders.
Admin agency	ICES-KIS 3

Project Name	Living with water
Acronym	LMW
Project Description	The overall aim of the project is to generate knowledge. - To mobilize, develop and focus knowledge to ensure it is applicable to sustainable infrastructure development. - To support water development on the basis of safety, welfare and economy.
Start date	2003
Project funding	45,200.00
End Date	2007
Research Themes	There are four themes and five research areas; The themes are: - Communication - valuation of water - management and institutional arrangements - functioning of the water system The research areas are; - Coast and Sea - River Areas - the low Netherlands - the high Netherlands - Urban areas 3 projects: perspectives in integral water management / floating city knowledge project / instruments for improving trans-national catchment area management.
Admin agency	ICES-KIS, CUR/NOK

Project Name	Netherlands Centre for River Studies Research Prog
Acronym	NCR
Project Description	The programme serves to coordinate the research activities of various research institutions and to secure the scientific development in river research. NCR is an umbrella organisation that has three functions: - Research - Education - 'platform'
Research Themes	The NCR aims at keeping the knowledge in river engineering at a sufficient level, even in times of reduced political priority. The themes are: - Platform function on river science - river-basin approach/system research - river and floodplain planning/ process and behavioural research - joint development of large systems - education and dissemination of knowledge and skills
Publication	www.ncr-web.org articles in journals, Phd. theses, conferences, website, meetings
Admin agency	WL Delft hydraulics

Project Name	Rhine-Meuse Delta Studies
Acronym	Delta Evolution
Project Description	Delta evolution is a long-term informal research program of the faculty of geosciences at Utrecht aiming to reconstruct and demonstrate the evolution of fluvial dominated estuaries and deltas.

	The study of fluvial deposits is important from both a scientific point of view and a practical point of view e.g. extraction of hydrocarbons and water, flood protection and applied geotechnics.
Research Themes	There are wide range of staff projects and Phd studies associated with Delta evolution of which a few a listed here: <ul style="list-style-type: none"> - 4D (time-space) process-based alluvial architecture model - Interaction of Early Holocene coastal evolution and fluvial dynamics - Soil map of the province of Utrecht - Biogeomorphological interactions within floodplains and their role in sediment transport and ecological transformation process in the lower Rhine Delta - The influence of climate, vegetation and human impact on the fluvial dynamics of the Rhine basin during past 15,000yrs.
Admin agency	Utrecht University
Funding Agency	NWO

Project Name	Values of Water
Acronym	WWW
Project Description	The project is highly aimed at practical application of results and at triggering changes in daily practice . Follow-up at other locations and new themes on the research agenda's from other parties, policy recommendations and a vision document. Key Words: Values, sustainability, ecology, economy, urban water management, change processes. Pilot projects regional.
Start date	2001
End Date	2008
Publication	articles published and dissemination by the STOWA, that will also evaluate the projects
Evaluation	Evaluation in order to disseminate the result among water managers. NIDO will also evaluate the programme but this has not happened yet.
Research Management Process	Evaluated by STOWA and NIDO

6.5 United Kingdom

6.5.1 Water resources assessment

Most of England consists of rolling lowland terrain, divided from more mountainous terrain in the north-west, north and south-west. The main rivers and estuaries are the Thames, Severn and the Humber Estuary. Scotland's geography is varied, with lowlands in the south and east and highlands in the north and west, including Ben Nevis, the highest mountain in the British Isles at 1,344m (4,406 ft). There are many long and deep-sea arms, firths, and lochs. There are nearly eight hundred islands in Scotland, mainly west and north of the mainland. In total, it is estimated that the UK includes around one thousand islands. Wales is mostly mountainous. Northern Ireland, making up the north-eastern part of Ireland, is mostly hilly. Lough Neagh, the largest body of water in the British Isles, by surface area (388 km² / 150 mi²).

England has a temperate climate, with plentiful rainfall all year round, though the seasons are quite variable in temperature. However, temperatures rarely fall below -4 °C and will only rise above 32 °C in the height of the summer. The prevailing wind is from the southwest, bringing mild and wet weather to England regularly, from the Atlantic Ocean. It is driest in the east, warmest in the southwest in winter (closest to Atlantic currents), and warmest in the southeast in summer (closest to the European mainland). Snowfall can occur in winter and early spring, though it is not that common away from high ground. Wales' climate is alike in most regards to that of England, The climate of Scotland is temperate and oceanic, and tends to be very changeable. It is warmed by the Gulf Stream from the Atlantic, and as such is much warmer than areas on similar latitudes, for example Oslo, Norway. However, temperatures are generally lower than in the rest of the UK. The whole of Northern Ireland has a temperate maritime climate, rather wetter in the west than the east, although cloud cover is persistent across the region. The weather is comparatively unpredictable at all times of the year⁶.

Table 27. Water resource indicators of UK

Environment - Water Resources	Internal renewable water resource total (km3)	145
	Internal renewable water resource per capita	2431
	Annual natural renewable water resource (includes flow from other countries)	147

6.5.2 Socio-economic assessment

Table 28. Socio-economic indicators of UK

Socio-economics	Area	244,820 sq km
	Population	60,776,238
Geography	Inhabitants per km2	248
Land use Social	Arable	23.23%
	Permanent Crop	0.2%
	other	76.57%

⁶ [source: wikipedia]

	Currency	GBP
	Life expectancy at birth (Women, Men), 2003	81.3, 76.23
	Total labour force (000s), 2006	3,048
	Government type	Constitutional monarchy
Size of GDP	Gross domestic product (OECD)	1 978.7561
	GDP per capita (OECD)	32 859.8771
	Volume index of GDP per capita (OECD)	113.4112
National income per capita	Gross national income per capita (OECD)	33 637.2681
Water consumption	Total gross water abstractions (OECD)	13 648.797
	Per capita water abstractions (OECD)	250

(Source: OECD & CIA World Factbook)

6.5.3 Legal, regulatory and management assessment

6.5.4 Key IWRM research programmes

In the UK the Technical Advisory Group (UKTAG) works on managing and delivering research relating to the water framework directive. As part of this process it undertakes a process to assess its research needs, through consultation with the technical experts and members of UKTAG. The UKTAG work programme has identified the following research areas as priority for delivery by December 2007.

- Classification tools (to support development and implementation of UK classifications schemes, monitoring programmes and assessment methodologies)
- Measures development
- Further characterisation activities (these may also inform classification and programme of measures)
- WFD communications (not a priority in 2006)

The deliverance of the WFD is defining the short-term research needs, focusing on the first river basin management plan. This is managed by the UKTAG and then implemented within the devolved administrations agencies. Medium term research becomes more divided into the various research programmes which cover sustainable development, or land use and rural stewardship for example. This is usually managed and implemented within devolved administration structures, such as the Scottish Executive, Department for Environment Northern Ireland or the Environment Agency England and Wales.

Project Name	Environment and Rural Affairs Department(ERAD) Sustainable Development
Acronym	SERAD
Project Description	This delivers scientific research that can be directly transferred to policy within the department.
Start date	n.a.
End Date	n.a.
Research Themes	Themes will vary depending on the priorities if government
Admin agency	SERAD
Funding Agency	SERAD

Project Name	Scottish Executive Water Env. Unit research programme
Acronym	WEU-RP
	Programme history (previous programmes)
Project Description	Operational for the last 4 years or so. Initiated with the transposition of WFD into Scottish law, and various consultations with industry, the public and other key bodies on WFD and its implementation.
Start date	2002
End Date	2006
Research Themes	Main themes are: <ul style="list-style-type: none"> - Hydro-system - Ecosystem - Water resources management - Economic Sciences
	Some key areas include; identification of ecological status in different water bodies, improved understanding of ecological functions, interaction with water quality and ecosystem improvement
Publication	stakeholders, industrial and business groups are included in steering groups and input into the design and provide information from which to develop some of the findings . Project results & consultations are available on the web
Research Management Process	There is a steering group review but not as in independent exercise like the EU mid-term review.
Admin agency	SERAD WEU
Funding Agency	SERAD

Project Name	UK Technical Advisory Group
Acronym	UKTAG
Project Description	WFD theme established in 2000. Priorities then (2000-02) were typology and groundwater , current work is related to monitoring classification and economic characterisation and reporting, forthcoming priorities include RBMP and pressures and impacts id.
Start date	2000
Project funding	5,000,000.00
End Date	2008
Research Themes	<ul style="list-style-type: none"> - Surface water and typology - Protected areas - Wetlands - Groundwater Characterisation - Pressures and impacts - Reference Conditions - Economic Analysis - Intercalibration - Objective setting - River basin planning
Publication	information is provided directly via presentations, reports or provision of other outputs where identified in results e.g.website. Researchers engaged in process encouraged to give talks and presentations. stakeholders, industry, scientific.

Evaluation	The programme is reviewed quarterly meetings of the SNIFFER WFD theme board (made up of member representative and SNIFFER staff). Projects are commonly peer reviewed. It is not evaluated in the sense of EU programme mid term review or final evaluation
Admin agency	SNIFFER
Funding Agency	All the UK environment Agencies

Project Name	North/South Share INTERREG programme
Acronym	N/S Share
Project Description	To improve the understanding and development of WFD requirements in Northern and Southern Ireland cross border river basins. In particular the ecological classification and status requirements.
Start date	2004
End Date	Expected 2015
Research Themes	The main theme is environment and climatic change, within this the WFD aspects will be delivered.
Admin agency	Environment and Heritage Service Northern Ireland

Project Name	Environment Agency WFD Programme
Acronym	EA-WFD
Project Description	The objectives are to develop tools and methods to meet the immediate needs for implementation of the WFD. Longer term the desire is to move towards research that supports a holistic approach to IRBM and understanding systems and processes.
Start date	2000
End Date	2008
Research Themes	<p>Main themes are:</p> <ul style="list-style-type: none"> - Ecosystem - Controlling risks - water resources management - economic sciences - social aspects - climatic change <p>sub-themes; Strategic technical planning, communications, characterisation, monitoring, classification, reporting, EU negotiations (hazardous substances & groundwater) RBMP, programme of measures, Ribble pilot study, data and information systems.</p>
Admin agency	Environment Agency
Funding Agency	Environment Agency

Project Name	UK Water Industry Research Programme
Acronym	UKWIR
Project Description	UKWIR facilitates collaborative research for UK water operators and the aim of the programme is to generate sound science for sound regulation and sound practice.
Start date	Ongoing
Project funding	
End Date	ongoing
Research Themes	<p>The Main themes are;</p> <ul style="list-style-type: none"> - Climate Change - Customer issues - Drinking Water - Environment and Qual - Regulation - Sewage Sludge - Toxicology - Water Mains, Sewers and Services - Water resources - Waste water treatment and sewerage
Publication	Website : http://www.ukwir.org/site/web/content/home

Research Management Process	The programme is managed on an annual basis with a programme for each year. UKWIR currently facilitates over 50 projects for UK Water Industry sponsors. Contractors bid for new projects in next year's programme. A project manager is assigned by UKWIR
Admin agency	UKWIR
Funding Agency	Water Industry sponsors – various.

Project Name	SNIFFER WFD
Acronym	SNIFFER WFD
Project Description	To aid the implementation of the Water Framework Directive in Scotland and Northern Ireland.
Start date	2000
End Date	Ongoing, long-term horizon
Research Themes	Work is tied into the process of implementing the WFD and so the priorities will change as this process develops. themes include: Monitoring, classification, economic characterisation and reporting. Future priorities include - River basin management planning - pressures and impacts identification - programme of measures - economic assessment - diffuse pollution - wetlands
Evaluation	The programme is reviewed quarterly by meetings of the SNIFFER WFD theme board. projects are commonly peer reviewed.
Admin agency	SNIFFER
Funding Agency	Scottish Environment Protection Agency and Environment Heritage Service Northern Ireland.

7. SUMMARY OF RESEARCH PROGRAMMES

The following section provides in tabular format a summary of the programmes according to their main areas of interest. The classification used is similar to the CIS classification used for assessing research needs in 2005 and provides some information on the research questions raised by the programmes. This work was undertaken by the International Office for Water and will be updated by analysis using the Knowledge Management tool and database currently in development.

THEMATIC	SUB-THEMATIC	QUESTIONING	List of themes related to programmes questioning	WFD Filter (Appendix VI) + main principles	ONGOING PROGRAMMES		Closed programmes	
1. Water Resource, Demand Management, Uses and Conflicts	global	What are the obstacles and the opportunities for sustainable management of resource? (institutional, political and economy, communication and knowledge transfer)	sharing knowledge and experiences		DIALOGUE (SW)	SEPA		
	1.1 Distribution of water resource - general						ECOBAG (FR)	ADERA
	1.1 Distribution of water resource	Resource distribution within one territory: sharing of knowledge, learning, adaptation of decision thresholds, innovations, local conciliation of public policies	governance / exchange of experiences and knowledge/public policies/uses	good practices	Eaux et territoires (FR)	MEDD		
		Incorporation of water quality in the issue of distribution between the different uses: progress for taking into account the stages in the water artificialized cycle?	uses		Eaux et territoires (FR)	MEDD		
		What are the impacts of water consumption on the resource distribution?	uses		Eaux et territoires (FR)	MEDD		
	1.2 Management of the use conflicts	The availability of water (quantitative and qualitative) and the genesis of use conflicts	crisis management		GLOWA (GE)	PTKA-WTE		
		Genesis of the management of use conflicts	crisis management		LITEAU III (FR)	MEDD		
	1.3 Water management in the regions with chronic shortage							
	1.4 Water savings							
	1.5 Water savings in irrigation	Which impacts of the socio-economic context on WM in farming? (irrigation /water supply)	economy	WM (Water Management)	GLOWA (GE)	PTKA-WTE		
		Management strategies of the aquifers and cross-border basin based on all players' participation: an element for regional scale WM and experience transfer	aquifers/sharing of knowledge and experiences		GLOWA (GE)	PTKA-WTE		
	1.6 Protection of water resources - general						IWRM (FIN)	SYKE
	1.6 Protection of water resources	What are the tools for preventing point pollution (technological approach)?		Integrated Pollution Prevention Control (IPC) Directive/new technologies			IWRM (FIN) / The science programme (UK)	SYKE / EA
		Evaluation of the diffuse pollutions and prevention of these pollutions		BEE, Integrated Pollution Prevention Control Directive	WFD (UK)	SNIFFER	WFD (UK)	SNIFFER
	1.7 Re-use of waters							

	1.8 Non conventional waters								
2. Management of groundwaters	2. Management of groundwaters - general							WFD (UK) / PIRENE (BELG)	SNIFFER / CENV-ULG
	2.1 Methodology for evaluation and monitoring chemical quality of karstic bodies of groundwaters								
	2.2 Threshold values for deterioration of chemical properties of bodies of water								
	2.3 Development of one common approach to quantify diffuse pollution	Management strategies of cross-border aquifers and basins based on the participation of all players: one element for WM at the regional level and experience transfer?	sharing of knowledge and experiences/public intervention	control of drafting	GLOWA (GE)	PTKA-WTE			
	2.4 Management of cross-border aquifers								
3. Knowledge of the physical processes								IWRM (FIN)	SYKE
	3.1 Hydrodynamics and sedimentary dynamics of surface waters					WSD (PORT)	FCT		
	3.2 Trend of erosion in coastal zones								
	3.3 Interactions between groundwaters (aquifers), surface waters and sediments								
	3.4 saline intrusion								
4. Knowledge on the ecological process								IWRM (FIN)	SYKE
	global	The protected marine areas and their ecological, social and economic functions (economic evaluation of services provided by environment)	ecology /economy/social		LITEAU III (FR)	MEDD			
	4.1 Links existing between the hydromorphological, chemical and biological conditions							IWRM (FIN)	SYKE
	4.2 hydrology - ecology links and morphology - ecology/meteorology links							METHODOLOGY FOR WFD (RO)	MMGA
	4.3 Research on the relevance of substances taken into account and link between the substances and the ecological status - general							IWRM (FIN)	SYKE
	4.3 Research on the relevance of substances taken into account and link between the substances and the ecological status	The parameters for defining good ecological status of the coastal ecosystems	IMCA	BEE	LITEAU III (FR)	MEDD	IWRM (FIN)		SYKE
	4.3 Research on the relevance of substances taken into account and link between the substances and the ecological status	What is the consistency between the defined parameters and the management and restoration actions?		BEE, restoration projects	LITEAU III (FR)	MEDD			
	4.3 Research on the relevance of substances taken into account and link between the substances and the ecological status	The scientific debates on the good ecological status		BEE	LITEAU III (FR)	MEDD			
		What are the impacts of the good ecological status objective on the social functions of the ecosystems?		BEE	LITEAU III (FR)	MEDD			
		What are the parameters to be taken into consideration to assess the good ecological status of the coastal waters?	IMCA	BEE				IWRM (FIN)	SYKE
4.4 Intercalibration of the assessment methods of the elements related to biological quality									

	4.5 Environmental standards (Appendix VIII and hazardous substances)								
	4.6 Modelling tools for defining the reference and evolution conditions						WFD (UK) / PIRENE (BELG)	SNIFFER / CENV-ULG	
	4.7 Development of the common biological assessment methods at the EU level								
	4.8 Objectives of flows								
5. Surveillance	5. Surveillance - general						The science programme (UK)	EA	
	5.1 Development of techniques for ecological surveillance	Identification of devices for the long-term observation of the AMPs	IMCA/prospective scenarios / sensitive environment	monitoring	LITEAU III (FR)	MEDD			
	5.2 Optimization of the monitoring networks	How to optimize the use of data from the monitoring networks?	measures programme	monitoring			IWRM (FIN)	SYKE	
		What are the operational tools and instruments for monitoring and control (data acquisition)?	measures programme	monitoring	WSD (PORT)	FCT			
	5.3 Links between the conditions of the bodies of water and the evaluation of their ecological status								
	5.4 Links between monitoring of the ecological status and modelling this status								
	5.5 Forecast and prevention of the extreme and rare phenomena								
6. Pressures and impacts - general							PIRENE (BELG)	CENV-ULG	
	6.1 impacts of societal developments on the state of the surface waters and groundwaters (reference thresholds)								
	6.2 Description of the ecological impacts						WFD (UK)	SNIFFER	
	6.3 Mechanisms of answer of the ecosystems to anthropic actions		modelling				ECOBAG (FR) / IWRM (FIN) / WFD (UK)	ADERA / SYKE / SNIFFER	
	6.3 Mechanisms of answer of the ecosystems to anthropic actions	How to define the feedback loops of the rupture thresholds?			monitoring	Eaux et territoires (FR)	MEDD		
		What is the impact of territory land planning on the appearance of ecosystems?			monitoring	Eaux et territoires (FR)	MEDD		
		What are the different time scales of answer of the environment to the anthropic actions?	good practices/ scales		monitoring	Eaux et territoires (FR)	MEDD		
What are the impacts of soils use, human activities, biodiversity on the ecosystems state?							IWRM (FIN)	SYKE	

		Which works should be undertaken regarding the prevention of eutrophication?			DIALOGUE (SW)	SEPA	IWRM (FIN)	SYKE
	6.4 Limitation of the impact of the mining industry							
	6.5 Closing of the old mines that had an impact on water quality and are likely to cause floods							
	6.6 Impacts of the hydraulic works	What are the new technologies for designing and monitoring the hydraulic works?			WSD (PORT)	FCT		
	6.7 Impact of farming on the bodies of water	What are the impacts of the use of soil (farming) on the water cycle?	WM	WM	GLOWA (GE)	PTKA-WTE		
	6.8 Quantification of the need for reducing the phenomenon of acidification, precipitation of heavy metals and of PoPs							
	6.9 Development of models of nitrogen, phosphorus and PoPs in coastal and marine zones							
	6.10 Mechanims of transfer from nitrogen and phosphorus in the waters and aquifers							
	6.11 PoPs content in the living organisms							
7. Data management							ECOBAG (FR)	ADERA
	7.1 Treatment and analysis of data	What are the dissociation procedures, in collected data, of the anthropic impacts on the state of the environment?	pressures and impacts		ENGO (SE)	SEPA		
	7.1 Treatment and analysis of data	What are the modalities for using the data allowing their utilisation to draw up an inventory of fixtures, to describe the situation, in recurent problems and the definition of the causes?			DIALOGUE (SW)	SEPA		
	7.2 Implementation of high performance tools for data storage				NDBHMI (GR)	NTUA		
	7.3 Data management via GIS	The use of GIS for the evaluation of the state of the environment			ENGO (SE) / NDBHMI (GR)	SEPA / NTUA		
8. Prospective models and Foresight	8.1 Development of ecological prediction and socio-economic models	How to build prediction model for the water demand management and territory land planning while guaranteeing economic development and the good ecological status?						
	8.2 Development and evaluation of prospective scenarios	What are the impacts of the social and environmental interactions on the economy?			Eaux et territoires (FR)	MEDD		
		Identify and find the tools for solving the social and environmental problems at the same time			GLOWA (GE)	PTKA-WTE		
	8.3 Presentation tools of the effects of the different measures and scenarios	What are the tools for understanding and evaluating the impacts of the human activities on the natural cycles (modelling)?	modelling		GLOWA (GE)	PTKA-WTE		
8.4 Methodologies for taking into account social and economic aspects in the development of prospective scenarios								
9. Measures Programmes							WFD (UK)	SNIFFER
	9.1 System for helping decision-making for the selection of the best alternative in one programme of measures	What are the optimal situations by scenario and between different scenarios (and in the related measures programmes) for one SD that incorporates a multi-level approach?	prospective scenarios		GLOWA (GE)	PTKA-WTE		

	What is the role of the indicators as support for information dissemination and help for decision-making?	help in decision-making/exchange of experiences				IWRM (FIN)	SYKE
9.2 General study of the most effective measures with the best cost/effectiveness ratio	How to develop the indicators for the evaluation of the different scenarios against SD?	prospective scenarios		GLOWA (GE)	PTKA-WTE		
9.3 Implementation of the measures programmes	What are the supports existing for developing the measures programmes?			ICES-KIS (NL)	RIZA	IWRM (FIN)	SYKE
9.4 Take into account the uncertainties related to the measures with regard to variable uncertainties related to the pressures of the sectors							
9.5 Systems for helping decision-making by taking into consideration the availability, the quality, the level of application of data and the resulting uncertainties							
9.6 System for helping decision-making adaptable to the different spatial levels							
9.7 Good practices for the evaluation of the impact of the measures related to the chemical and biological status of the surface waters and groundwaters							
9.8 The indicators for monitoring and evaluation	What are the indicators for operation dynamics of the ecosystem and evaluation of its social and economic value?	social	economic and fiscal instruments	LITEAU III (FR)	MEDD		
	What are the indicators for the management of the environment and water to be developed?	players/institutional				METHODOLOGY FOR WFD (RO)	MMGA
9.9 Limitation of the impact of the works for building the works protecting against floods							
9.10 Evaluation of the measures for rehabilitation and restoration of the different environments - general						IWRM (FIN)	SYKE
9.10 Evaluation of the measures	What are the methods for diagnosis of the different altered habitats to be defined?		restoration projects	LITEAU III (FR)	MEDD		
	Typologies of the different environments and the evolution dynamics: what are the resilience factors and contexts of the coastal habitats?	IMCA	restoration projects	LITEAU III (FR)	MEDD		
	How to take into consideration the constraints of the players in the restoration models?	players	restoration projects	LITEAU III (FR)	MEDD		
	What are the restoration actions consistent with the social functions of the habitats?	social	restoration projects	LITEAU III (FR)	MEDD		
	What are the players concerned by the restoration actions?	players	restoration projects	LITEAU III (FR)	MEDD		
	How to carry out an analysis of the impacts of the reserve effect (in the sense of hydrologic park) on the habitats?		restoration projects	LITEAU III (FR)	MEDD		

		Evaluation of the state of the natural resources and the efficiency of the management plans			ENGO (SE)	SEPA			
10. Economy	10.1 Scale of analysis of the pressures and cost/effectiveness analysis				WFD (UK)	SNIFFER	IWRM (FIN)	SYKE	
	10.2 Costs-advantages analysis and costs recovery	How to incorporate qualitative water economy in the satisfaction of needs and uses?	WM/uses	economic or fiscal instruments	Eaux et territoires (FR)	MEDD			
		The evaluation of the economic value of water through the different sectors of activity	WM/uses	economic or fiscal instruments	ICES-KIS (NL)	RIZA			
		How to take into account the costs-advantages (social, financial and economic) analysis in the administrative process (in the sense of one political decision) ?	institutional	economic or fiscal instruments	ICES-KIS (NL)	RIZA			
	10.3 New mechanisms for costs recovery and first programmes of measures								
	10.4 Develop the business as usual models and take into consideration in the cost/effectiveness analysis, the scenarios derived from an incomplete implementation of the water policies								
	10.5 Impacts on the economy of the enhancement of the public policies		public policies					IWRM (FIN)	SYKE
		What is the impact of the improvement of the territorial management of water on employment?			ICES-KIS (NL)	RIZA			
	10.6 Coordination of the cost/effectiveness analyses for the cross-border bodies of water								
	10.7 Incorporate into the cost/effectiveness analyses the costs generated by the measures timescales								
10.8 Favour the economic evaluation for the measures programmes with short timescales	How to take into account the long-term cost-advantages in the short term policy systems? (framed by elections)	economy/scales	economic or fiscal instruments	ICES-KIS (NL)	RIZA				
10.9 Evaluation of the disproportionate costs of the measures in the protected zones when there is flexibility in the means for achieving the objectives in the WFD									
10.10 Value of the services provided by the environment	Economic evaluation of the services (for ex. purification, storage services..) provided by the habitats	ecology	economic or fiscal instruments	Eaux et territoires (FR)	MEDD				
	What is the ecological value of water and the consideration scale of the sensitive areas?	scales /sensitive areas		ICES-KIS (NL)	RIZA				
11. Social	11.1 Heritage, social value of water	What are the heritage values related to the altered habitats?			LITEAU III (FR)	MEDD			
	11.2 Social and economic impacts of the deterioration of the ecosystems	What are the impacts of social behaviours on the management of the natural resources?	economy				IWRM (FIN)	SYKE	
12. Crisis	12.1 Triggering factors and		governance						

Management	crisis intensity: development of protocols for anticipation and avoidance	Triggering factors and crisis intensity: how to develop protocols for anticipation and avoidance?		good practices?	Eaux et territoires (FR)	MEDD			
		The conflicts of uses: causes or consequences of the crisis?	uses		Eaux et territoires (FR)	MEDD			
	12.2 Impact of one crisis on the different uses	What are the impacts of one crisis on the different uses according to its intensity, frequency and its scale?	ecology/economy/social		Eaux et territoires (FR)	MEDD			
	12.3 Dialogue structures and place in crisis management	What are the dialogue stages and their place within the conciliation structures of crisis management?			Eaux et territoires (FR)	MEDD			
	12.4 definition of the scales for sustainable management of the crisis	The definition of the territory: one element in sustainable development essential for solving a crisis?	scales		Eaux et territoires (FR)	MEDD			
		What are the tools for crisis management adapted to each player?			Eaux et territoires (FR)	MEDD			
13. Incorporation of the sector policies and public policies	13.1 Support for help in public decision - general				WFD (UK)	SNIFFER	METHODOLOGY FOR WFD (RO)	MMGA	
					WSD (PORT)	FCT	The science programme (UK)	EA	
	13.1 Support for help in public decision	How to adjust the tools for helping in decision-making for sustainable management of the resources at the catchment level?	WM			GLOWA (GE)	PTKA-WTE		
		tools for helping in making public decision				Eaux et territoires (FR)	MEDD	ECOBAG (FR) / PIRENE (BELG)	ADERA / CENV-ULG
		How to create one system for helping in decision-making for sustainable use of the usable resources and their development?	WM			GLOWA (GE)	PTKA-WTE	ECOBAG (FR)	ADERA
		How to incorporate the sector policies?			legislative instruments	Eaux et territoires (FR)	MEDD	ECOBAG (FR)	ADERA
	13.2 Integration scales of the sector policies	How to allow the adequacy of the public policies with the scales of water existence (time, spatial, social economic...scales)?	governance		legislative instruments	Eaux et territoires (FR)	MEDD		
		How to take into account the public policies in the different time scales of water management?	governance		legislative instruments	Eaux et territoires (FR)	MEDD		
		Can the incorporation of sector policies be achieved within one single and same territory according to the stakes, the topics, the players...?	governance		legislative instruments	Eaux et territoires (FR)	MEDD		
		What are the public policies stakes related with the collaboration with the companies?			legislative instruments			IWRM (FIN)	SYKE
		What are the legal, institutional, economic and financial instruments necessary for the incorporation of the policies for the management of the environment, water and sustainable development in the local and sector strategies?	institutional		legislative instruments, administrative instruments, economic or fiscal instruments				METHODOLOGY FOR WFD (RO)

	13.3 Evaluation of the policies	How to evaluate the efficiency of the policies related to the environment?		legislative instruments, administrative instruments, economic or fiscal instruments			IWRM (FIN)	SYKE
	13.3 Evaluation of the policies	The evaluation of the adequacy of the environmental legislative tools and of their uses to achieve the environmental objectives	legislation		ENGO (SE)	SEPA		
14. Risks management					WSD (PORT)	FCT	The science programme (UK)	EA
	14.1 Nature and analysis of the impacts	What are the variations of the spatial and time impacts of the extreme phenomena over one territory according to its characteristics?			Eaux et territoires (FR)	MEDD		
		What are the impacts, in terms of risk, related to erosion?			LITEAU III (FR)	MEDD		
		What are the impacts, in terms of risk, related to climate change?	CC / prospective scenarios		LITEAU III (FR)	MEDD	IWRM (FIN)	SYKE
		What are the impacts, in terms of risk, related to pollutions?			LITEAU III (FR)	MEDD		
		What are the impacts, in terms of risk, related to invasive species?	ecology / prospective scenarios		LITEAU III (FR)	MEDD		
		What are the social elements of risk regulation?	social / prospective scenarios				IWRM (FIN)	SYKE
	14.2 Vulnerability of the territories and decision levels							
		Forecasting and prevention of the extreme and rare phenomena		monitoring	Eaux et territoires (FR)	MEDD		
		What are the decision levels adapted to risks management? (governance)	governance		Eaux et territoires (FR)	MEDD		
		How to characterise vulnerability of the territories to risks under a long-term management objective?	prospective scenarios		Eaux et territoires (FR)	MEDD		
What are the tools offering protection against floods of populations and properties?						The science programme (UK)	EA	
15. Water management scales	15.1 Relevant scales for space and time management of water	How the IMCA is perceived by the different players?	IMCA		LITEAU III (FR)	MEDD	PIRENE (BELG)	CENV-ULG
		How to define the water-territory system?			Eaux et territoires (FR)	MEDD		
		What are the stakes involved by the definition of the water-system in terms of land planning and development?			Eaux et territoires (FR)	MEDD		
		The territory: spatial and social entity, framework for conflicts arbitration, of the analysis of the interactions between water management and economic development?	Economy /uses		Eaux et territoires (FR)	MEDD		

	What are the imbrications of impacts scales on water management?	governance		Eaux et territoires (FR)	MEDD		
	How to define the areas concerned to facilitate the implementation of one dedicated management body via pluridisciplinary integration?	governance		LITEAU III (FR)	MEDD		
	How to define and take into account the different scales in the habitats management? (not solely the local scale)			LITEAU III (FR)	MEDD		
	Which adaptations are required in the institutional system for a good territory management of water?		administrative instruments	ICES-KIS (NL)	RIZA		
	What is the impact of the integration of the IMCA into the public policies on governance at the different territory scales?	governance	legislative instruments	LITEAU III (FR)	MEDD		
	Definition of the rules for management and good practices adapted to multi-scales management		good practices	Eaux et territoires (FR)	MEDD		
15.2 Relevant scales for time management of water						PIRENE (BELG)	CENV-ULG
	How to incorporate a vision of long-term water management within the policy usually used at short term?	prospective scenarios	legislative instruments	ICES-KIS (NL)	RIZA		
	What is the role of the private players in water management and funding of actions?	economy		ICES-KIS (NL)	RIZA		
	Governance or subsidiarity? What are the right management players at each stage of the artificialized cycles of water?	WM		Eaux et territoires (FR)	MEDD		
	Adequacy of the decisions scales and of the territories			Eaux et territoires (FR)	MEDD		
	What are the governance systems in the IMCA?	IMCA		LITEAU III (FR)	MEDD		
	What is the place of environment in the IMCAs and the involvement for governance of the coastal uses?	IMCA/uses		LITEAU III (FR)	MEDD		
	Which are the right territorial levels of decision of water management? (skills, distribution, consistency, overlapping...)			ICES-KIS (NL)	RIZA		
	How to get the players involved in sustainable management of the resource?			ICES-KIS (NL)	RIZA		
	How to combine the skills from different players so as water management is achieved under an integrated process?			ICES-KIS (NL)	RIZA		
	What are the key elements of governance with regard to the main sectors of activity (agriculture, pisciculture, timberland) ?	economy				IWRM (FIN)	SYKE
	Are the integrated policies of water management adapted to the realities of the territories? (relationship between decisions and actions)	public policies		Eaux et territoires (FR)	MEDD		
	Water management and satisfaction of downstream needs	WM		Eaux et territoires (FR)	MEDD		
	What are the impacts of the water uses upstream and on the working of the water-territory system?			Eaux et territoires (FR)	MEDD		
	What are the interlocking of the territories and the hindrances to good water management? (conflicts notably)			Eaux et territoires (FR)	MEDD		

		How to initiate, negotiate and ensure the implementation of the international provisions relating to international conventions and agreements?	institutional	agreements negotiated in the environment field			METHODOLOGY FOR WFD (RO)	MMGA	
		The role of mass media in the international management of water	institutional				METHODOLOGY FOR WFD (RO)	MMGA	
16. Participative management and sharing of knowledge and experiences for better public participation	16.1 dissemination /exchange/sharing of experiences and knowledge - general				National Plan (SP)	MEC			
	16.1 dissemination /exchange/sharing of experiences and knowledge	What are the collaboration tools between the national and transnational research programmes that should be developed ?	sharing of the knowledge and experiences		GLOWA (GE)	PTKA-WTE			
		What are the tools and procedures for the analysis of the sharing process of knowledge and data between scientists and water players?			ENGO (SE)	SEPA	ECOBAG (FR)	ADERA	
		What are the tools and procedures for analysis of the sharing process of knowledge and data between the different administration levels that have environmental skills?	institutional		ENGO (SE)	SEPA	METHODOLOGY FOR WFD (RO)	MMGA	
		dissemination and structuring of learning and data			Eaux et territoires (FR)	MEDD			
		How to facilitate the exchanges of knowledge between the research world and the industry world via the development of cooperation?			GLOWA (GE)	PTKA-WTE			
		How to favour the transfer of knowledge and learning between scientists and managers?			LITEAU III (FR)	MEDD			
		How to favour the exchanges of knowledge and learning between the different players?	institutional		ICES-KIS (NL)	RIZA	METHODOLOGY FOR WFD (RO)	MMGA	
		How to integrate the feedback from experiences from overseas into water management?			ICES-KIS (NL)	RIZA			
		Knowledge sharing: a key element in governance?	governance				IWRM (FIN)	SYKE	
		How to promote communication in order to favour the research and development projects?					IWRM (FIN)	SYKE	
	How to favour knowledge sharing notably through training and education by ensuring communication between the ministries, local authorities, educative, scientific and cultural institutions and the mass medias?	public policies/ public intervention/institutional					METHODOLOGY FOR WFD (RO)	MMGA	
	16.2 Promote dialogue between the players				DIALOGUE (SW)	SEPA			
	16.2 Promote dialogue between the players	What are the institutional bases required for dialogue on the policies, strategies and decisions regarding sustainable development?	institutional				METHODOLOGY FOR WFD (RO)	MMGA	
16.3 Public information and participation				WFD (UK)	SNIFFER	The science programme (UK)	EA		

		The importance of public and private players ' participation in water management		public participation	ICES-KIS (NL)	RIZA		
		How can water become a priority for all the concerned players		public participation	ICES-KIS (NL)	RIZA		
		At what time in the decision process will public participation occur?		public participation	ICES-KIS (NL)	RIZA		
		Which structure should be developed in order to ensure public information about the quality of the environment components?	public intervention	public participation			METHODOLOGY FOR WFD (RO)	MMGA
17. Project selection and management	17.1 Improving the impacts assessments						METHODOLOGY FOR WFD (RO)	MMGA
	17.2 Promote the creation of projects consortia	How to legally favour the creation of public/private partnerships?	institutional	agreements negotiated in the environment field			METHODOLOGY FOR WFD (RO)	MMGA
18. others	18.1 Climate Change						ECOBAG (FR) / IWRM (FIN)	ADERA / SYKE
		How to manage water demand in the developing countries and over the Mediterranean region while incorporating the changes implied by climate change?	WM /resource distribution	WM	GLOWA (GE)	PTKA-WTE		
	18.2 Floods							
	18.3 Industrial wastewaters							
	18.5 Urban wastewaters						IWRM (FIN)	SYKE
18.5 Urban wastewaters	What are the impacts and interactions of the urban use of water over the surrounding rural territories?				Eaux et territoires (FR)	MEDD		

8. RESEARCH ANALYSIS

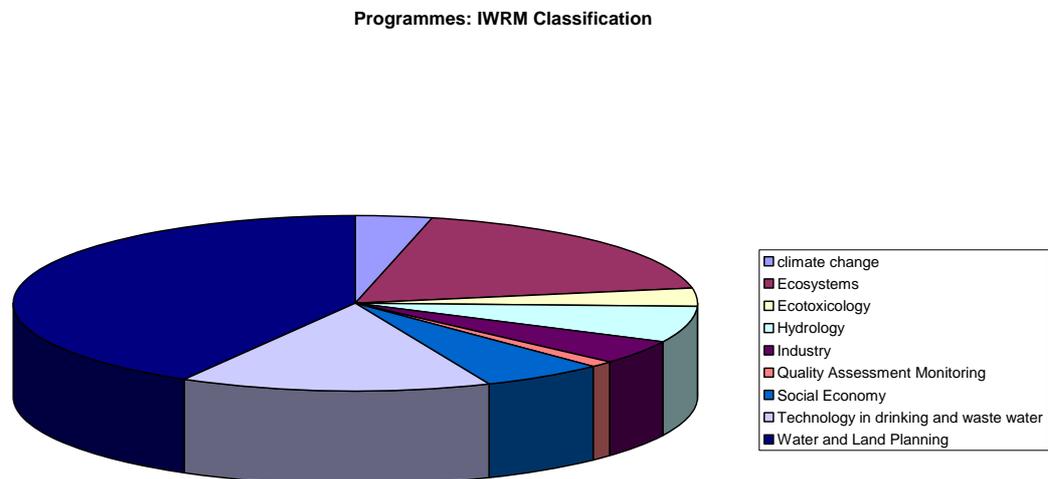
This section aims to provide a general analysis of the themes and subjects covered by the IWRM-net partner research programmes. This information will provide a snapshot into the subjects and will form the basis of continual analysis using the Knowledge Management Tool (KMT) currently in development. For more information on the KMT please visit the IWRM-net website <http://www.iwrn-net.org/>.

The figures below are based in the analysis from the programmes listed in the database. The majority of this information has been provided as part of the requirements for the specific support action and is currently being updated as part of the ongoing development of the database. Future reports will update this analysis below in an attempt to ensure IWRM-Net development is based on the most up-to-date information.

A variety of classification methods have been used. This will allow a variety of assessments to be made to the programmes as many are very broad in their scope and not all specific to water.

A note of caution must be provided to the data provided as it has not undergone any quality assurance process at this stage and is very much based on view of the editor. Future analysis will take into account QA. For such broad analysis the issue of QA is not vital as any direction suggested will be subject to further scrutiny by the partners.

Figure 7 : Research Programmes from IWRM partners classified by IWRM thematics



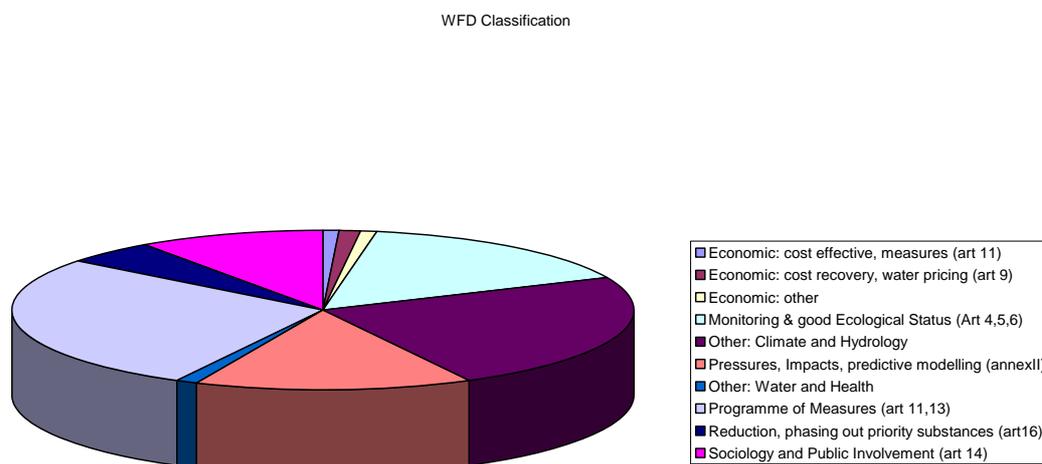
From the above chart it is clear that the area of water and land planning dominates the current research programmes. This analysis ties in with the Water Framework Directive and its requirements for the implementation of river basin planning. Within this such broad analysis the programmes included are for example the UKTAG programme which covers a wide range of

subjects specifically related to the implementation of the WFD or The Romanian programme ICIM1 - Methodologies and instructions for the implementation of Water Framework Directive for the national water resources, legislation harmonisation, waste-water, nitrates, ecotoxicology, land management, characterisation and monitoring. From these programmes it is clear that identification of research needs will require more detailed analysis of subjects.

Monitoring is not stated as the major subject within a number of programmes but is present in a significant number as the example from Romania above suggests. Only one programme lists 'surveillance' as a topic and this is the Environment Agencies 'Science' programme.

The lack of social economy programmes highlights this fact in that 'social economy' is an important aspect of water and land planning but is not covered by targeted programmes.

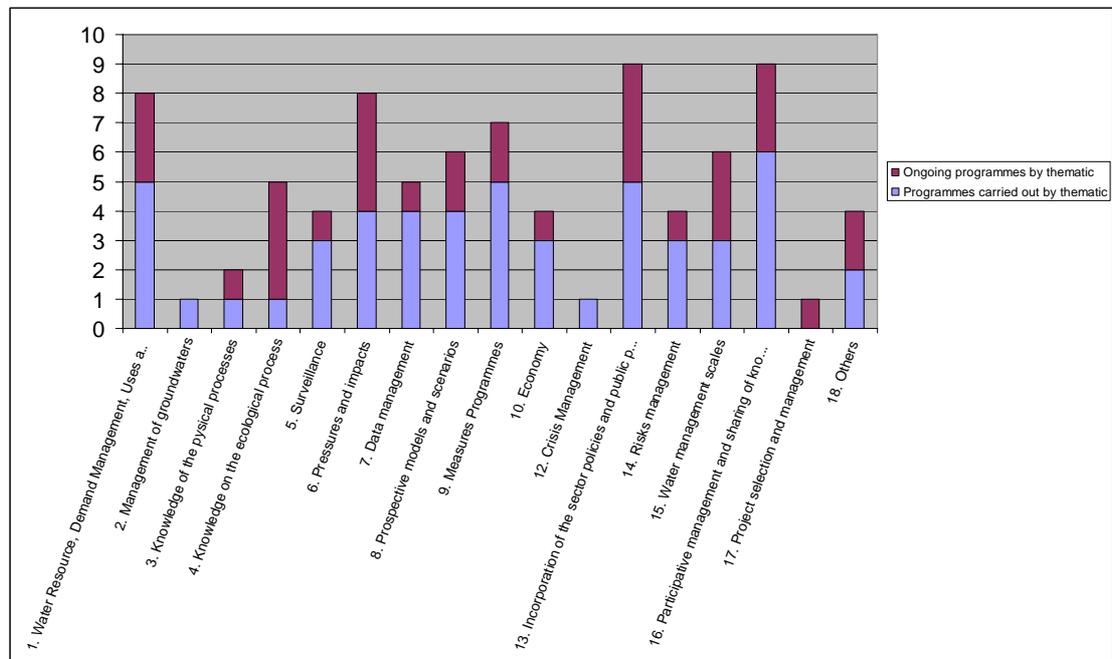
Figure 8 : Research Programmes from IWRM partners classified by WFD thematics



When we look at the break-down of programmes related to the articles in the Water Framework Directive specifically then certain aspects of planning are covered significantly such as programme of measures (article 11 & 13). Pressures and impacts modelling is delivered reasonably well by partner programmes along with climate and hydrology and monitoring and good ecological status. Areas not covered well within IWRM-Net partner research programmes are economic aspects such as cost effectiveness, pricing and cost recovery. It is significant that economic issues are not covered in any detail when using the WFD classification and this is supported by the previous analysis using IWRM classifications, where the inclusion of social aspects only sees the number of programmes rise a small amount.

The following analysis modifies the classification used by the CIS group which allows a more comprehensive division of thematic for water management. This classification is used in the table printed earlier in this chapter and will be used increasingly within analysis for IWRM-net.

Figure 9: Research Programmes from IWRM partners classified by 'CIS' thematics



When using the 'CIS' classification economy does not stand out as an area needed urgent consideration. The areas that are significantly lower are management of groundwaters and crisis management.

This summary of information is intended to provide a basis for discussion in developing the future research needs that will be supported and funded by IWRM-Net partners. The IWRM research agenda is in development and this paper will be presented to the partners at the joint meeting in April/May 2009 as a means of setting out the work programme into the future. A development document will be available to all partners and those collaborating via the regional research need documents.

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- Lundqvist, L. J. (2004) *Integrating Swedish water resource management: a multi-level governance trilemma*. Local Environment, 2004 (Vol. 9) (No. 5) 413-424. Department of Political Science, Göteborg University, 405 30 Göteborg, Sweden.

9.3 Web sites

- OECD Environmental Indicators, www.oecd.org/env/indicators.
- OECD Water Supply and Sanitation Sector Reform, www.oecd.org/env/water.
- <http://en.wikipedia.org/>
- <http://web.worldbank.org/>
- <https://www.cia.gov/library/publications/the-world-factbook/geos/lg.html>
- [http://www.seniorwatch.de/country/austria/Socio-econenvir\(Austria\).htm](http://www.seniorwatch.de/country/austria/Socio-econenvir(Austria).htm)
- <http://www.oecd.org/>
- <http://wasser.lebensministerium.at>
- <http://www.NationMaster.com>
- <http://www.ecologic-events.de/cap-wfd/documents/haaranen.pdf>
- <http://www.ymparisto.fi/default.asp?node=4077&lan=en>
- <http://www.waternunc.com/gb/ageau2gb.htm>
- <http://earthtrends.wri.org>
- <http://www.fao.org/statistics/>

9.4 Definitions

Water Availability: per capita average (1961-1990) Thousand m³/person. Average annual surface run-off and groundwater recharge generated from endogenous precipitation.

Actual Renewable Water Resources: Per capita - Cubic meters (m³) per person per year

Per Capita Actual Renewable Water Resources gives the maximum theoretical amount of water actually available, on a per person basis, for each country. In reality, a portion of this water may be inaccessible to humans. Actual renewable water resources are defined as the sum of internal renewable resources (IRWR) and external renewable resources (ERWR), taking into consideration the quantity of flow reserved to upstream and downstream countries through formal or informal agreements or treaties and possible reduction of external flow due to upstream water abstraction.

Internal renewable water resources (IRWR) are comprised of the average annual flow of rivers and recharge of groundwater (aquifers) generated from endogenous (internal) precipitation. Even though IRWR measures a combination of surface and groundwater resources, it is typically less than the sum of the two because of overlap-water resources that are common to both surface and groundwater.

External renewable water resources (ERWR) are the portion of the country's renewable water resources which is not generated within the country. The ERWR include inflows from upstream countries (groundwater and surface water), and part of the water of border lakes or rivers.

Per capita water resources are calculated by WRI using 2006 and 2007 population estimates from the United Nations Population Division. For a full description of population data sources, collection methodologies, and data uncertainties.

Actual Renewable Water Resources: Total Units: Cubic kilometers (km³)
Total Actual Renewable Water Resources gives the maximum theoretical amount of water actually available for each country, although in reality a portion of this water may be inaccessible to humans. Actual renewable water resources are defined as the sum of internal renewable resources (IRWR) and external renewable resources (ERWR), taking into consideration the quantity of flow reserved to upstream and downstream countries through formal or informal agreements or treaties and possible reduction of external flow due to upstream water abstraction.

Internal renewable water resources (IRWR) are comprised of the average annual flow of rivers and recharge of groundwater (aquifers) generated from endogenous (internal) precipitation. Even though IRWR measures a combination of surface and groundwater resources, it is typically less than the sum of the two because of overlap-water resources that are common to both surface and groundwater.

External renewable water resources (ERWR) are the portion of the country's renewable water resources which are not generated within the country. The ERWR include inflows from upstream countries (groundwater and surface water), and part of the water of border lakes or rivers.

Internal Renewable Water Resources (IRWR): Total
Internal Renewable Water Resources (IRWR) is comprised of the average annual flow of rivers and recharge of groundwater (aquifers) generated from endogenous (internal) precipitation. Natural incoming flows originating outside a country's borders are not included in the total. Even though IRWR measures a combination of surface and groundwater resources, it is typically less than the sum of the two because of overlap-water resources that are counted with both surface and groundwater (see the Methodology section below for a more complete description of overlap).

IRWR is calculated as follows:

IRWR = surface water resources + groundwater resources - overlap.

Gross Domestic Product (US\$)

Gross domestic product (GDP) is the standard measure of the value of the goods and services produced by a country during a period. Per capita GDP is a broad indicator of economic living standards. Each country calculates GDP in its own currency and,

in order to compare countries, these estimates have to be converted into a common currency. Often, the conversion is made using exchange rates, but these give a misleading comparison of the real volumes of goods and services in the GDP. Comparisons of real GDP between countries can best be made using purchasing power parities (PPPs) to convert each country's GDP into a common currency. PPPs are currency converters that equalise the purchasing power of the different currencies (see also Rates of conversion).

"Gross" signifies that no deduction has been made for the depreciation of machinery, buildings and other capital products used in production. "Domestic" means that it is production by the residents of the country. As many products are used to produce other products it is necessary to define production in terms of value added. GDP can be measured in three different ways: as output less intermediate consumption (i.e. value added) plus taxes less subsidies on products (such as VAT); as the income earned from production by summing employee compensation, gross operating surplus of enterprises and government and net tax on production and imports (VAT, payroll tax, import duties, etc); or as the expenditure on the goods and services produced by summing consumption expenditures, gross fixed capital formation, changes in inventories and exports less imports.