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## **DROUGHT ASSESSMENT AND FORECASTING**

***Draft Report by Ms G. Monacelli (Italy)***

WORLD METEOROLOGICAL ORGANIZATION  
WORKING GROUP ON HYDROLOGY  
REGIONAL ASSOCIATION VI  
(EUROPE)

## **DROUGHT WITHIN THE CONTEXT OF THE REGION VI**

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## PREFACE

The fight against drought and desertification receives a high priority in the **Long-term Plan** of the **World Meteorological Organization (WMO)**, particularly under the Agricultural Meteorology Programme, the Hydrology and Water Resources Programme and the Technical Co-operation Programme. Furthermore, WMO continues to actively involve the National Meteorological and Hydrological Services (NMHSs) and the regional and sub-regional meteorological centres and other bodies in the improvement of hydrological and meteorological networks for systematic observation, exchange and analysis of data; develop and improve long-term strategies to promote meteorological and hydrological activities that contribute to better monitoring of droughts; develop and promote the use of medium and long-range weather forecasts; assist in the transfer of knowledge and technology; and strengthen and intensify research on the interactions between climate, the hydrological regime and desertification.

The six Regional Associations (RAI - Africa, RAI - Asia, RAI - South America, RAI - North and Central America, RAI - South-west Pacific and RAI - Europe) of WMO have each established a working group on hydrology (WGH) with terms of reference encompassing the range of topics covered by the HWRP (Hydrology and Water Resources Programme). Decisions concerning the implementation of these regional activities are taken by the associations at their four-yearly meetings. The work is undertaken by the associations' reporters and working groups, with the support of the WMO Secretariat, the technical support being provided by the HWR Department. These working groups consider hydrological problems of interest in their respective Regions. They identify the impacts of climate variability and change on water resources, water quality, droughts, and floods (both extreme events and forecasting and warning) as the scientific areas on which to focus the activities of the Working Group.

Therefore this initiative is a unique tool for identifying the strengths and weaknesses of government actions in water and drought management across Europe and to lobby for change. It helps to determine where and on what issues particular action is needed. The study will be carried out using an Index, which systematically assesses some significant aspects of water and drought policy and management at a national level. Finally the Index provides transparent, comprehensible, and accessible environmental information on droughts issues to the general public.

Thirty Countries of the WMO Region VI are included in the European Community.

The **Water Framework Directive (2000/60/EC)** is the most significant piece of European water legislation in 20 years. The concept of integrated water management is at the mind of the directive. Water issues, such as drought, flooding, abstraction, water quality, aquatic habitats and biodiversity, will be dealt with in an integrated way under the directive.

Its aim is to bring about the co-ordination of water environmental policy and regulation across Europe, in order to:

- prevent the deterioration of, and enhance water quality;
- ensure reduction/prevention of groundwater pollution;
- reduce/eliminate pollution from priority hazardous substances;
- promote sustainable water use contributing to flood mitigation and drought.

The WFD sets out a detailed framework for the improved protection and management of water, from source to sea, and requires all inland and coastal waters to reach "good status" by 2015. It will do this by:

- o the introduction of a system of management of the water environment based on river basin districts (River Basin Management Plan);
- o the introduction of a programme of measures to improve water quality.

Some exceptions (derogations) from the requirement to meet good ecological status may be allowed where:

- the water body is heavily modified/artificial. Such bodies would be expected to reach ‘good ecological potential’;
- the work required is technically infeasible or disproportionately expensive;
- there are unforeseen or exceptional circumstances (e.g. flood or drought).

The implementation of the Water Framework Directive raises a number of shared technical challenges for the Member States, the Commission, the Candidate and EEA Countries as well as stakeholders and NGOs.

In addition, many of the European river basins are international, crossing administrative and territorial borders and therefore a common understanding and approach is crucial to the successful and effective implementation of the Directive.

In order to address the challenges in a co-operative and coordinated way, the Member States, Norway and the Commission agreed on a **Common Implementation Strategy** (CIS) for the Water Framework Directive on the 2<sup>nd</sup> may 2001.

Under the CIS were established the **Working Groups** to develop guiding and supporting documents on key aspects of the WFD. Actually, these groups are:

- o Working Group A on “Ecological Status”
- o Working Group B on “Integrated River Basin Management”
- o Working Group C on “Groundwater”
- o Working Group D on “Reporting”

In November 2003 during their meeting in Roma the Water Directors recognised the necessity of tackling the issue of the water scarcity at the light of drought events that had already occurred all over Europe.

Water scarcity can be understood as either water deficiency resulting from the demand being bigger than the supply or resulting from droughts or a combination of these two phenomena. Nevertheless quantitative issues are probably less developed than quality issues in the following technical articles of the WFD.

This concern of the Water Directors has led to the creation of a working group on scarcity. This working group has met twice in 2004 and has resulted in a collaborative workshop with the research community. During the meetings the working group has identified that the scarcity issue should be treated through two phenomena leading to different actions and effects:

- drought events management;
- water scarcity resulting from supply-demand imbalances.

The effects of climate change on scarcity issues will also be tackled within this group.

The working group has also identified that the link with research activities should be strong in order to provide definitions, assessments, and pilot studies.

EU member states are among the most important donors in the water – development sector and can draw on a wealth of experience in international development cooperation and water management. Against this background the **EU Water Initiative (EUWI)** was launched at the 2002 World Summit for Sustainable Development in Johannesburg.

The EUWI is designed to contribute to the achievement of the Millennium Development Goals and World Summit for Sustainable Development targets for drinking water and sanitation, within the context of an integrated approach to water resources management.

The EU is committed to contribute to achieving the following international goals:

- to halve by 2015 the proportion of people who are unable to reach or afford safe drinking water and the proportion of people who do not have access to adequate sanitation;
- to establish national water resource management plans by 2005.

The EUWI uses a modular or building block approach. It puts together a cluster of building blocks that assist in bringing different stakeholder activities within a common framework. The EUWI aims to add value to ongoing activities within the EC and EU Member States to improve collaboration

with partners in other regions. It seeks to provide an enabling environment for complementary actions within the thematic areas.

The EUWI, and particularly its Mediterranean component, have created a working group with representatives of non EU countries, Mediterranean stakeholders and water experts, who have already a great experience of scarcity issues. In order to merge the efforts and share experiences it is proposed to associate two representatives of the Mediterranean working group to the drafting group of the CIS (already including other non EU countries).

The main objective of the drafting group is to provide and share information, and possible actions in order to react on scarcity issues. The drafting group will have to stress the links and potential gaps of water scarcity issues and WFD. The final output will be a report addressing different types of definitions, issues, and related actions.

## PART I – Drought

Water supply is strictly related to the primary human activities. Drought produces a complex set of impacts on environment and on economy.

### 1. Drought definition

#### *General considerations*

The available water over land has, fundamentally, an atmospheric source (cyclic water). In the table some estimates of the volumes for the available water are shown:

Source	Volume ( $10^6 \text{ km}^3$ )	% Total
Ocean	1320	97.20
Snow and ice	30	2.15
Subsoil at a depth < 800m	4	0.31
Subsoil at a depth > 800m	4	0.31
Unsaturated zones	0.07	0.005
Fresh water lakes	0.12	0.009
Salt water lakes	0.10	0.008
Atmosphere	0.013	0.001
Rivers	0.001	0.0001

An annual mean precipitation estimate is around  $0.5 \cdot 10^6 \text{ km}^3$ . This value is forty-times as big as the water present in the atmospheric average. Therefore, a total recharge of the atmospheric water occurs in a short period (around 9 days).

The principal physical processes that lead to the annual cycle are:

- The general atmospheric circulation;
- The atmospheric energy balance;
- The condensation and evaporation processes;
- The surface evaporation and evapotranspiration processes.

In the study of the hydrological cycle, these processes are of primary relevance leading to the final result, i.e. the precipitation, which must be diagnosed in a climatological context. The occurrence of dry and wet periods is a feature of the natural variability of the hydrological cycle. It manifests itself in different time and space scales and it produces several impacts on society.

The word "Drought" is often associated with different meanings. Therefore, it is worth explaining the fundamental aspects about the concept of drought in a hydrometeorological context.

#### 1.1 The Concept of Drought

Drought is a normal, recurrent feature of climate, although it is erroneously considered as a rare and random event. It differs from aridity, which is restricted to low rainfall regions and is a permanent feature of climate. Drought should be considered relative to some long-term average conditions of the balance between precipitation and evapotranspiration (i.e., evaporation + transpiration) in a particular area. It is also related to the timing (principal season of occurrence, delays in the start of the rainy season, occurrence of rains in relation to principal crop growth stages) and the effectiveness (i.e., rainfall intensity, number of rainfall events) of the rains. However, these are only

conceptual definitions, that are unable to give an operational definition of drought. There are two main definitions of drought: conceptual and operational.

## 1.2 Conceptual Definitions of Drought

Conceptual definitions, formulated in general terms, help people understand the concept of drought. For example, drought is a protracted period of deficient precipitation resulting in extensive damage to crops, further resulting in loss of yield. Conceptual definitions may also be important in establishing drought policy.

## 1.3 Operational Definition of Drought

An operational definition of drought helps people to identify the beginning, end, and degree of severity of a drought. This definition is usually made by comparing the current situation to the historical average, often based on a 30-year period of record (according to World Meteorological Organization recommendations). The following categories of drought are usually considered:

- **Meteorological**

Meteorological drought is usually defined on the basis of the degree of dryness (in comparison to some “normal” or average amount) and the duration of the dry period. Definitions of meteorological drought must be considered as specific to a region since the atmospheric conditions that result in deficiencies of precipitation are highly variable from region to region.

- **Agricultural**

Agricultural drought links various characteristics of meteorological (or hydrological) drought to agricultural impacts, focusing on precipitation shortages, differences between actual and potential evapotranspiration, soil water deficits, reduced groundwater or reservoir levels, and so forth.

- **Hydrological**

Hydrological drought is associated with the effects of periods of precipitation (including snowfall) shortfalls on surface or subsurface water supply (i.e., streamflow, reservoir and lake levels, groundwater). The frequency and severity of hydrological drought is often defined on a watershed or river basin scale.

- **Hydrological with respect of the land use**

Although climate is a primary contributor to hydrological drought, other factors such as changes in land use (e.g., deforestation), land degradation, and the construction of dams all affect the hydrological characteristics of the basin.

- **Socioeconomic**

This occurs when physical water shortage starts to affect people, individually and collectively or, in more abstract terms, most socio-economic definitions of drought are associated with the supply and demand of an economic good.

These operational definitions can also be used to analyse drought frequency, severity, and duration for a given historical period.

## 1.4 Impacts of drought

All the definitions are related to the impacts of a dry spell on the human activities: the impacts of drought may be environmental, economical and social.

The environmental impact is the result of damages to plant and animal species, wildlife habitat, air and water quality; forest and fires, degradation of landscape quality; loss of biodiversity, and soil



erosion. Some of the effects are only short-term and normal conditions are quickly reestablished. Other environmental effects linger for some time or may even become permanent. For example, the degradation of landscape quality, including increased soil erosion, may lead to a permanent loss of biological productivity of the area.

The economical impact occurs in agriculture and related sectors, including forestry and fisheries, which depend on the surface and groundwater supplies. In addition to obvious losses in yields in both crop and livestock production, drought is associated with the increase in insect infestations, plant disease, and wind erosion.

The social impact is present in periods of extreme, persistent drought. In these cases some emergency sources of water are required to take safety measure to safeguard public health.

## **2. Droughts indices**

Because there is no single definition for drought, its onset and termination are difficult to determine. We can, however, identify various indicators of drought, and tracking these indicators provides us with a crucial means of monitoring drought.

Drought indices assimilate thousands of bits of data on rainfall, snowpack, streamflow, and other water supply indicators into a comprehensible big picture. A drought index value is typically a single number, far more useful than raw data for decision making.

There are several indices that measure how much precipitation for a given period of time has deviated from historically established norms. Although none of the major indices is inherently superior to the rest in all circumstances, some indices are better suited than others for certain uses.

In the international publications different indices have been discussed and applied. Among those we mention:

- 2.1 Percent of Normal;
- 2.2 Deciles;
- 2.3 Palmer Drought Severity Index (PDSI);
- 2.4 Surface Water Supply Index (SWSI);
- 2.5 Standardized Precipitation Index (SPI).

### **2.1. Percent of Normal**

This index is computed by dividing the actual precipitation by the "normal" precipitation (typically considered to be a 30-year mean) and multiplying by 100. This index can be calculated for a variety of time scales. Usually these time scales range from a single month to a group of months.

One problem is that the distribution of the precipitation, on time scales less than one year, is not gaussian. For this reason the mean usually differs from the median. This introduces an error in the evaluation of the deviation from the values of the cumulated precipitation considered "normal" for a specific time-space scale. The equation for this index is:

$$I = \frac{\langle P \rangle}{\langle P \rangle_{30}} \times 100$$

Values of the index less than 100 means drought conditions exist.

## 2.2. Deciles

The distribution of the time series of the cumulated precipitation for a given period is divided into intervals each corresponding to 10% of the total distribution (decile). Gibbs e Maher (1967) proposed to group the deciles into classes of events as listed in the following table:

Class	Percent	Period
Decile 1-2	20% lower	Much below normal
Decile 3-4	20% following	Below normal
Decile 5-6	20% medium	Near normal
Decile 7-8	20% following	Above normal
Decile 9-10	20% more high	Much above normal

## 2.3. Palmer Drought Severity Index (PDSI)

Palmer (1965) developed this index based on the supply-and-demand concept of the water balance equation. The objective of the index is to measure the departure of the moisture supply for normal condition at a specific location. The PDSI is based on precipitation and temperature data, on the local Available Water Content (AWC) of the soil and other meteorological parameters. The Palmer Index has been widely used but it has some limitations. Among these we mention: the index is highly sensitive to the AWC of a soil type and that there are some difficulties in comparing the results obtained in regions with a different water balances. The Palmer Index varies between -6.0 and +6.0. The index classification is shown in the following table:

PDSI	Class
4.0 or more	Extremely wet
3.0 to 3.99	Very wet
2.0 to 2.99	Moderately wet
1.0 to 1.99	Slightly wet
0.5 to 0.99	Incipient wet spell
0.49 to -0.49	Near normal
-0.5 to -0.99	Incipient dry spell
-1.9 to -1.99	Mild drought
-2.0 to -2.99	Moderate drought
-3.0 to -3.99	Severe drought
-4.0 or less	Extreme drought

## 2.4. Surface Water Supply Index (SWSI)

The Surface Water Supply Index (SWSI) was developed by Shafer and Dezman (1982) to complement the Palmer Index. It is designed for large topographic variations across a region and it

accounts for snow accumulation and subsequent runoff. The procedure to determine the SWSI for a particular basin is as follows: monthly data are collected and summed for all the precipitation stations, reservoirs, and snowpack/streamflow measuring stations over the basin. Each summed component is normalized using a long-term mean. Each component has a weight assigned to it depending on its typical contribution to the surface water within that basin.

Like the Palmer Index, the SWSI is centered on zero and has a range between -4.2 and +4.2. The SWSI suffers the same limitations discussed for the PSDI.

## 2.5. Standardized Precipitation Index (SPI)

The SPI was developed by McKee et al (1993). It was designed to quantify the precipitation deficit for multiple time scales. These time scales reflect the impact of a drought on the availability of the different water resources. Soil moisture conditions respond to precipitation anomalies on a relatively short scale. Groundwater, streamflow, and reservoir storage reflect the longer-term precipitation anomalies. For these reasons, McKee et al. (1993) originally calculated the SPI for 3, 6, 12, 24, and 48 month time scales. The calculation of the index needs only precipitation record. It is computed by considering the precipitation anomaly with respect to the mean value for a given time scale, divided by its standard deviation. The precipitation is not a normal distribution, at least for time-scales less than one year. Therefore, the variable is adjusted so that the SPI is a gaussian distribution with zero mean and unit variance. A so adjusted index allows to compare values related to different regions. Moreover, because the SPI is normalized, wet and dry climates can be monitored in the same way. The index calculation is based on the following expressions:

$$SPI = + \left( t - \frac{c_0 + c_1 t + c_2 t^2}{1 + d_1 t + d_2 t^2 + d_3 t^3} \right), t = \sqrt{\ln \left( \frac{1}{H(P)^2} \right)} \quad \text{per } 0 < H(P) < 0.5$$

$$SPI = - \left( t - \frac{c_0 + c_1 t + c_2 t^2}{1 + d_1 t + d_2 t^2 + d_3 t^3} \right), t = \sqrt{\ln \left( \frac{1}{(1 - H(P))^2} \right)} \quad \text{per } 0.5 < H(P) < 1$$

where P is the cumulated precipitation for the given time-scale, H(P) is the cumulative probability of the observed precipitation and  $c_0$ ,  $c_1$ ,  $c_2$ ,  $d_1$ ,  $d_2$ ,  $d_3$  are mathematical constants. The classification shown in the following table is used to define drought intensities resulting from the SPI computation:

SPI values	Class
>2	extremely wet
1.5 to 1.99	very wet
1.0 to 1.49	moderately wet
-0.99 to 0.99	near normal
-1 to -1.49	moderately dry
-1.5 to -1.99	severely dry
< -2	extremely dry

## PART II - Planning for drought

### Introduction

Each drought produces a unique set of impacts, depending not only on its severity, duration, and spatial extent but also on ever-changing social conditions. Society's vulnerability to drought is determined by a wide range of factors, both physical and social, such as demographic trends and geographic characteristics. One of the challenges of planning for drought is understanding its impacts, both direct and indirect. In the last few decades, interest in planning for drought has increased at all levels. The tremendous cost (economic, social, and environmental) associated with the impacts of drought is one of the reasons for this interest. Although drought is a natural hazard, society can reduce its vulnerability to it and therefore lessen the risks associated with drought episodes. The impacts of drought, like those of other natural hazards, can be reduced through mitigation and preparedness (risk management). Planning ahead to mitigate drought gives decision makers the chance to relieve the most suffering at the least expense. Reacting to drought in "crisis mode" decreases self-reliance and increases dependence on government and donors.

Planning for drought is essential, but it may not come easily. There are many constraints to planning:

- Politicians, policy makers, and the general public may lack an understanding of drought.
- In areas where drought occurs infrequently, governments may ignore drought planning, or give it low priority.
- Governments may have inadequate financial resources.
- No single definition of drought applies to all regions.
- Responsibilities are divided among many governmental jurisdictions.
- Most countries lack a unified philosophy for managing natural resources, including water.
- Policies such as disaster relief and outdated water allocation practices may actually deter good long-term natural resource management.

One of the major impediments to drought planning is its cost. Officials may find it difficult to justify the costs of a plan, which are immediate and fixed, against the unknown costs of some future drought. (These unknown costs of drought are not entirely economic; they also include human suffering, damage to biological resources, and the degradation of the physical environment, items whose values are inherently difficult to estimate.) But studies have shown that crisis-oriented drought response efforts have been largely ineffective, poorly coordinated, untimely, and inefficient in terms of the resources allocated.

Moreover, drought planning efforts can use existing political and institutional structures, and plans can (and should) be incorporated into general natural disaster or water management plans, thus reducing the cost of planning effort.

Mitigating drought—taking actions in advance of drought to reduce its long-term risk—can involve a wide range of tools. These tools include policies, activities, plans, and programmes.

A European Drought Preparedness Network could provide the opportunity for nations and regions to share experiences and lessons learned (successes and failures) through a virtual network of regional networks; for example, information on drought policies, emergency response measures, mitigation actions, planning methodologies, stakeholders involvement, early warning systems, automated meteorological networks, the use of climate indices for assessment and triggers for mitigation and response, impact assessment methodologies, reduction of demand/water supply augmentation programmes and technologies, and procedures for addressing environmental conflicts.

Working individually, many nations and regions will be unable to improve drought coping capacity. Collectively, working through global and regional partnerships, we can achieve the goal of reducing the magnitude of economic, environmental, and social impacts associated with drought.

This section presents the various mitigatory tools that Italy has employed; they are listed here not as recommendations but to give planners an idea of the available options. Some tools may be inappropriate in some areas.

We have divided the mitigative strategies listed by respondents into 4 categories:

- Legislation/Public Policy
- Institutions involved in water and drought planning and management
- Data and information system
- Plans and actions in drought management

## **WATER AND DROUGHT INDEX (WDI)**

The WDI is an initiative which intends to stimulate debate on how to improve the strategies of water management and combating drought, in Region VI of the WMO. It starts from the assessment of the legislative and political responses of government organs and of authorities responsible for water management, and from the assessment of the adopted monitoring systems, where existing, to combat the growing problem of drought.

In the first part the fundamental concepts are described which have been developed in international scientific spheres around the subject of drought.

Starting from a common definition of the term and of the different aspects which drought can assume in relation to the time scale with respect to which it is considered, we can evaluate in an objective way what can be the risks the environment, both physical and social, can be exposed to.

There are abundant international publications on methodologies which address monitoring of the phenomenon, from which it is necessary to begin for a deeper knowledge of it and for the development of strategies aimed at its mitigation. For this reason the indices most used in the countries which have implemented an operative monitoring system for many years now have been described.

In the second part, dedicated to each country, in particular, it is intended to give an as wide as possible overview on the current legislative, political-institutional situation, and planning of interventions. All factors to be considered in the perspective of a sustainable development, taking into account the final aim of an integrated management of natural resources, in particular water.

The WDI will be applied to all countries of Region VI of the WMO (Europe): Austria, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Latvia, Netherlands, Norway, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, United Kingdom of Great Britain and Northern Ireland.

The study will be implemented through an index to be respected for the compilation of a report which will allow the systematic evaluation of some significant aspects of the policy related to water at national level. The index is articulated in four chapters which concern: legislation, institutions involved, data information systems and interventions.

The collection of information will be carried out by the Hydrological Service of APAT (Agency for the Protection of the Environment and for Technical Services), and the results will be given to CHy of the WMO for the joint decision on the distribution modalities.

## INDEX

### 1. LEGISLATION / PUBLIC POLICY

#### **MAINS LAWS AND DECREES ISSUED ON WATER RESOURCES USE, FLOOD DEFENCE AND POLLUTION CONTROL**

DATE	N.º	NAME	NOTE
.....	.....	.....	.....
.....	.....	.....	

#### **LEGISLATIVE INNOVATIONS IN WATER AND DROUGHT MANAGEMENT**

1. LAW N.º \_\_\_\_\_
2. NAME \_\_\_\_\_
3. ADVANCED ASPECTS:

<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>
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### 2. INSTITUTIONS INVOLVED

#### **THE MAJOR INSTITUTIONS WHICH PLAY A ROLE IN COMBATING DROUGHT**

1. NATIONAL LEVEL:

<ol style="list-style-type: none"><li>1. _____</li><li>2. _____</li><li>3. _____</li><li>4. _____</li><li>... _____</li></ol>
---

2. REGIONAL LEVEL:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
- ...

3. OTHER INSTITUTIONS:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
- ...

3. DATA AND INFORMATION SYSTEM

**THE INSTITUTIONS THAT COLLECT, RECORD AND PROCESS DATA THAT PROVIDE A REPRESENTATION OF NATURAL PROCESSES AND SOCIO-ECONOMIC PATTERNS DIRECTLY OR INDIRECTLY RELATED TO DROUGHTS**

1. NATIONAL LEVEL:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
- ...

2. REGIONAL LEVEL:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
- ...

3. OTHER INSTITUTIONS:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
- ...

4. PLANS AND ACTIONS IN DROUGHT MANAGEMENT

**MITIGATION ACTIONS**

1. NATIONAL LEVEL:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
- ... \_\_\_\_\_

2. REGIONAL LEVEL:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
- ... \_\_\_\_\_

4. OTHER INSTITUTIONS:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
- ... \_\_\_\_\_

**PLANNING METHODOLOGIES**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
- ... \_\_\_\_\_



# ANNEX I - CYPRUS

## INDEX

### 1. LEGISLATION / PUBLIC POLICY

#### **MAINS LAWS AND DECREES ISSUED ON WATER RESOURCES USE, FLOOD DEFENCE AND POLLUTION CONTROL**

The legal framework in Cyprus has been enacted during the colonial era and still remains in force by virtue of the provisions of Article 188 of the Constitution. Additions and modifications were made to the legislation since then to take account of changes, new developments and trends, but these were very limited.

Following are the main provisions of the most important Laws.

DATE	N.º	NAME	NOTES
Enacted in 1928 Revised many times after 1960	Cap 341	Government Waterworks Law	This law empowers the government to plan, design, construct, operate and maintain, any waterworks, to sell water, to buy water rights, to assess water rights, to fix water tariffs and to collect water sale bills. It is the most important water resources law but it really fails its purpose, since it does not define one administrative authority for effective overall responsibility of the water resources and waterworks.
	Cap 351	Wells law	
	Cap 342	Irrigation Divisions (Villages) Law	Under this law the water is linked to the land and not to the proprietors
	Cap 115	Irrigation (Private Water) Associations Law	The proprietors must have water rights and the individuals own the water without any reference to the land
	Cap 350	Water Supply (Municipal and Other Areas) Law	This law provides for the creation of Water Boards for the towns
	Cap 349	Water (Domestic Purposes) Village Supplies Law	This law provides for the creation of village water Commissions for village water supply.
		Sewage and Drainage Law	This law provides for the creation of Sewage Boards for the collection, treatment and disposal of sewage effluent and drainage water from areas defined by the Council of Ministers as "Sewage and Drainage Law Areas".
	69/91	Water Pollution Control Law	This law provides for the abolition or reduction and the control of water pollution. It also provides for the protection and

			improvement of the environment and the animal and plant life in water.
It was published in the Official Government Gazette on 20 February 2004.	13(I)/2004)	Water Protection and Management Law	This law transposing all the provisions of the Directive 2000/60/EC.

## LEGISLATIVE INNOVATIONS IN WATER AND DROUGHT MANAGEMENT

1. **LAW N.º:**
2. **NAME:**
3. **ADVANCED ASPECTS:**

1. **LAW N.º:**
2. **NAME:**
3. **ADVANCED ASPECTS:**

1. **LAW N.º:**
2. **NAME:**
3. **ADVANCED ASPECTS:**

### 2. INSTITUTIONS INVOLVED

#### THE MAJOR INSTITUTIONS WHICH PLAY A ROLE IN COMBATING DROUGHT

##### 1. **POLICY LEVEL:**

The policy control of the water management in Cyprus is at present divided between the Ministry of Agriculture, Natural Resources and Environment, the Ministry of the Interior, the Ministry of Finance and the Planning Bureau.

The **Ministry of Agriculture, Natural Resources and Environment** into which the Water Development Department, the Geological Survey Department, the Department of Agriculture and the Environment Services are incorporated, is the main Ministry for water policy. The close relationship between water supply and agricultural irrigation is obviously dealt with in this Ministry but the Ministry also advises on all aspects of water development.

The **Ministry of the Interior**, however, has the legal responsibility for local government through its District Officers. It has an interest in water supplies for new areas of building development and tourist areas and factories but also in irrigation schemes. It has the legal control over ground water resources and issues all required licences and permits.

The **Ministry of Finance** is responsible for budgeting and financial issues and the Minister is the chairman of the Planning Bureau. All expenditure is dealt with by the Accountant General and the Budgeting Officer whereas all main contracts by the Central Tender Board chaired by the

Accountant General. The Personnel Services which controls all personnel and employment and the Government Stores, the Department of Statistics and the Printing Office are all in this Ministry.

The **Planning Bureau** is the economic coordination and administration arm of the Central Planning Commission whose chairman is the President of the Republic. In practice it operates closely with the Minister of Finance and is the controlling authority for the use of Government development funds. It has a close interest in Water Development as the supply of water is a limiting factor on economic development and expenditure on capital works is a large portion of the budget.

In addition to these Ministries the following are also related in the Water Management.

The Ministry of Commerce, Industry and Tourism is concerned with tourist aspects and industrial estates.

The Ministry of Labour is involved in the process for licensing and control of sewage and emissions from the industry.

The Ministry of Health is responsible for checking the quality of drinking water.

## 2. EXECUTIVE LEVEL:

At executive level the management of water is mainly in the hands of the Water Development Department of the Ministry of Agriculture, Natural Resources and Environment but in a lot of cases only in an advisory capacity.

The **Department of Water Development** is responsible for formulating and executing the Government's overall policy on water resources planning, design and construction on the Island. It co-operates in the management of water resources and water development projects with other Departments, Ministries and distribution organizations. Since 1982 the Department also undertakes the design and construction of sewerage and sewage disposal works for Town Sewage Boards and Sewage Schemes for Villages.

Legal power as a result of the existing legislation lies mainly with the District Officers of the Ministry of the Interior.

The Department of Agriculture is closely concerned with irrigation matters, the Geological Survey Department with the development of boreholes, the Department of Environment is dealing with environmental issues of water and sewage works and the Land Surveys Department with the registration of water rights.

The Accountant General of the Ministry of Finance deals with loans and tenders and the Planning Bureau with budgets.

## 3. USER LEVEL:

Domestic water supplies are managed by the **Town Water Boards** in the major metropolitan areas of Nicosia, Larnaca and Limassol, by Municipal Authorities in other municipalities and by Community Boards for village water supplies.

Irrigation water supplies are managed by local Irrigation Divisions formed of landowners and at a lesser extent by Irrigation Associations formed of water-rights owners, both chaired by the District Officers. Government irrigation schemes supply water to the farmers and are managed directly by the Water Development Department.

## 4. OTHER INSTITUTIONS:

The most important such organizations are the four Farmers Unions but the Scientific Technical Chamber of Cyprus, various Environmental Organizations, the Commerce and Industry Chamber

and the Consumers Association are also involved in water policies especially when the interests of the their members are affected.

There are four Farmers Unions in Cyprus namely the Panagrotikos, EKA, PEK and Agrotiki, each one associated with the four biggest political parties of Cyprus, something which sometimes affect their behaviour. However since water is a limiting factor in agricultural development, the Unions pressure and interference has played a significant role in water and consequently in agricultural development in Cyprus during the last forty years. The Unions had also their involvement in the allocation of the poor water reserves during the last dry years, in their effort to secure as much water as possible for irrigation versus the Government's policy to place water supplies for domestic and industrial uses as first priority.

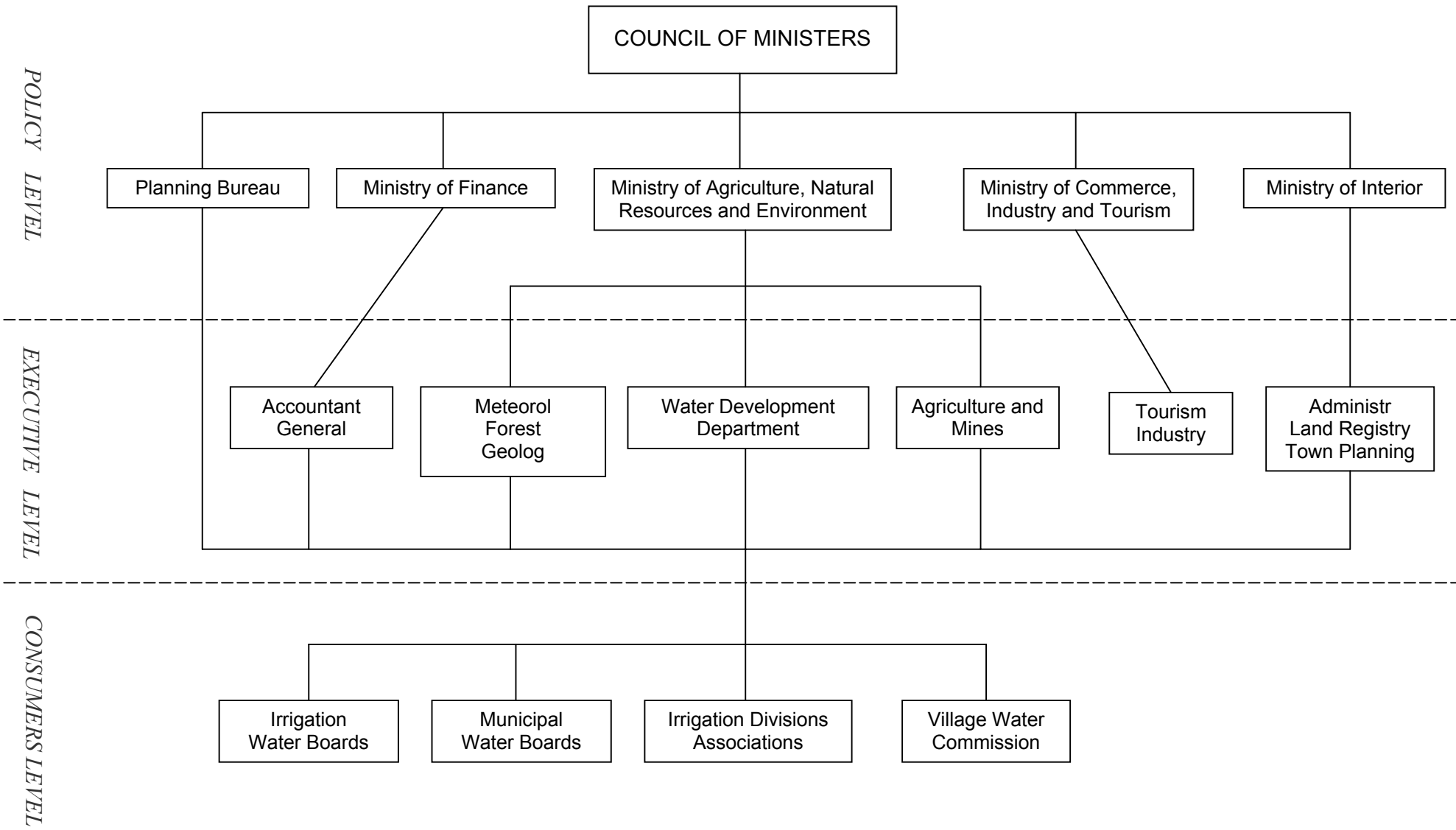
The Scientific Technical Chamber of Cyprus, is a rather new establishment and therefore its role as the technical advisor of the Government in whatever concerns water is rather limited.

The environmental organizations and especially the Ecological and Environmental Movement, which has become a political party, have been seriously involved in water policy during the last ten years, when environmental sensitivity in Cyprus has grown up. Their opposition to the Government's programme for the establishment of sea water desalination plants was continuously expressed, along with their resistance to further agricultural development, before all measures for the reduction of losses and efficient use of water were taken. However the great need of water for both domestic uses and irrigation in a situation of continuous dry periods has diminished their influence in water policy.

The role of the Commerce and Industry Chamber of Cyprus is rather limited to securing adequate quantities of water to their members at the lowest possible rates and to safeguarding the interests of contractors involved in water works.

Finally the Consumers Association has placed particular importance on the quality of the water, which is provided to the consumers by the Government or by other sources.

By and large one could say that the Farmers Unions are by far more active in expressing their views on water management than the other involved organizations and to ask and be involved in water development through a systematic dialogue with the Ministry of Agriculture, Natural Resources and Environment.



### 3. DATA AND INFORMATION SYSTEM

#### **THE INSTITUTIONS THAT COLLECT, RECORD AND PROCESS DATA THAT PROVIDE A REPRESENTATION OF NATURAL PROCESSES AND SOCIO-ECONOMIC PATTERNS DIRECTLY OR INDIRECTLY RELATED TO DROUGHTS**

##### 1. NATIONAL LEVEL:

INSTITUTION	Type of data
Meteorological Service Governmental Office	Climate
Water Development Department	Water resources It is the agent in charge of water resources management including drought conditions
Department of Agriculture	Soils Land use Agriculture
Land Surveys Department	Land
Statistics Department	Economic indicators Demographic indicators

##### 2. REGIONAL LEVEL:

INSTITUTION	Category of data	Data

##### 3. OTHER INSTITUTIONS:

INSTITUTION	Category of data	Data

### 4. PLANS AND ACTIONS IN DROUGHT MANAGEMENT

#### **MITIGATION ACTIONS**

##### 1. NATIONAL LEVEL:

##### 2. REGIONAL LEVEL:

##### 3. OTHER INSTITUTIONS:

#### **PLANNING METHODOLOGIES**

Water scarcity is very real in Cyprus. Like other Mediterranean countries, Cyprus has a semi-arid climate and limited water resources. Rainfall is highly variable with considerable regional variations and often two or three or sometimes up to six consecutive dry years are observed.

### Measures in periods of drought

Most recently, low rainfall in the years from 1996 to 2000 has produced drought conditions in Cyprus. The drought has caused a variety of problems for Cyprus and various measures were implemented to face the situation. These were as follows:

- Water supply restrictions
- Demand management measures
- Supply enhancement measures

### Efficiency of measures

The restrictions in the supply of water were, in general, accepted by the public. Nearly everybody realised the necessity of imposing such restrictions because of the existing large gap between the supply and the demand. During the application of the restriction measures the consumption in every economic sector decreased. The results were deemed as satisfactory.

The demand management measures announced by the Government were readily accepted by the water consumers as evidenced by the large number of applications filed, especially for those measures bearing subsidies by the Government. The largest numbers of applications were filed in Nicosia, which faced the most acute water shortage.

The third and last bundle of actions in combating the prevailing drought i.e., the increase in the supply of water via the erection of a new desalination plant and the use of recycled water had found approval by the majority of the people.

In conclusion, the emergency plan for combating the prevailing drought was quite successful. The objectives of the plan were met in full. The “water conscious” of the public towards this scarce resource was high and vivid making the introduction of the measures rather easy.

## **WATER CONSERVATION IN CYPRUS**

### *TWO PRACTICAL MEASURES FOR CONSERVATION OF DRINKING WATER*

Conservation of drinking water has been initiated as a practical means of assisting water demand management where, for instance, capital expenditure on water resource development (new dams, main conveyors, water treatment etc) might be reduced or deferred. “Water saved is exactly the same as water supplied” and “One person’s reduction in water use makes water available for someone else to use”.

As a practical measure to save drinking water, a scheme has been put into practice during the last few years, for subsidizing the drilling of private boreholes or the recycling of “grey water” for watering the garden and/or for the operation of the WC’s in the individual households. With these two practical measures there is at the moment a saving of 2,0 million cubic meters per year of drinking water. This is because only about half of the average annual supply of domestic water in Cyprus needs to be of drinking water quality. Over 50% of the demand for water could be met by water of a lower grade quality, such as processed water.

### *SECOND QUALITY WATER FROM BOREHOLES IN THE BUILT-UP AREAS*

In Cyprus there are shallow aquifers, the depth of which is around 60 meters from ground level. There are such aquifers in some areas of towns and villages. These aquifers are recharged by the onsite wastewater systems, such as septic tanks/absorption pits in addition to natural recharge from precipitation and river flows.

The Government of Cyprus through the Department of Water Development is subsidizing this scheme to encourage the consumers to use this second quality water for watering their gardens and for use in operating the WC's. Each consumer can drill his own borehole outside his house. The cost of drilling such a borehole with the installation of a small electro-submersible pump is approximately €1.500 from which the Government gives to the consumer €350 as a subsidy. The connection of the borehole with the WC's of the household is easy, and the cost is approximately €550. For this connection the Government gives another €350 as subsidy.

With this scheme there is a drinking water conservation of between 30% and 65%.

#### *RECYCLING OF GREY WATER*

In Cyprus lightly polluted or Grey Water from baths, showers, hand or wash-basins and washing machines is kept separate from heavily polluted or Black Water from WC's and kitchens. As a result it is relatively easy to intercept each type of wastewater at household level for subsequent treatment and reuse. This reuse is novel in Cyprus.

After five years research and two years (1997-1998) experimental work on a pilot scale the Government of Cyprus decided to subsidize the installation of a Grey Water Treatment Plant. The cost of such a treatment plant for a household with a production of 1 cubic meter per day is €1.400 and a subsidy of €700 is given. With this scheme there is a conservation of drinking water from 30% to 45% of the per capita water consumption. This means that the conservation of drinking water from every two persons covers the needs of the third person.



## **ANNEX II - FINLAND REPORT**

### **INDEX**

#### **1. LEGISLATION / PUBLIC POLICY**

##### **MAINS LAWS AND DECREES ISSUED ON WATER RESOURCES USE, FLOOD DEFENCE AND POLLUTION CONTROL**

Directive 2000/60/EC of the European Parliament.

19/05/1961 N° 264; Water act (15 §, 4.2.2000/88):

all the action that causes increase in flood risk, water pollution or water shortage for someone is prohibited.

01/06/1984 N° 413; Dam safety law

is a law for dams bigger than 3 meter high.

19/03/1983 N° 284; Law on exceptional flood damage compensation:

law enables government to cover some expenses, due to flood damage or flood mitigation (e.g. buildings, roads, trees... etc.), from government's budget.

09/02/2001 N° 119; Water supply and sewerage law:

the law covers water supply system, storm water and drainage water treatment and conduction.

30/07/2004 N° 686; the water supply aid law:

this law enables government to support those water supply systems or individuals having difficulties to connect to the existing water supply system or build at reasonable cost a new water supply and/or waste water system.

19/08/1994 N° 737; Environmental damage 'compensation' law:

defines when an environmental damage must be compensated to another party.

1972; The Convention on Protection of the Marine Environment of the Bal-tic Sea Area:

this convention, dating back to 1972, was the first environmental convention to include all sources of pollution to the Baltic Sea and also to have the participation of the Eastern European states.

1991; The Arctic Environmental Protection Strategy of 1991:

cooperation between eight Arctic countries.

1994; The Convention to Combat Desertification and Drought:

Finland ratified the convention in 1995. In general, this convention bears direct relevance to food-security and maintenance of biodiversity of the fragile ecosystems. Likewise it can be considered a water, climate and forestry issue. The many-faceted nature is well illustrated in the text of the convention itself.

## LEGISLATIVE INNOVATIONS IN WATER AND DROUGHT MANAGEMENT

1. **LAW N.º:** 1991 N° 263

2. **NAME:** The Forest damage law

3. **ADVANCED ASPECTS:**

Law defines that the trees that are damaged by for example insects (due to the drought) must be removed from a forest within a certain time (cut and remove). If they are not removed in time and it causes damage to other forest owners this damage must be compensated. It is proposed that a new law would set countable limits such as number of trees per area and size of them.

1. **LAW N.º:** 03/04/2003 N° 270

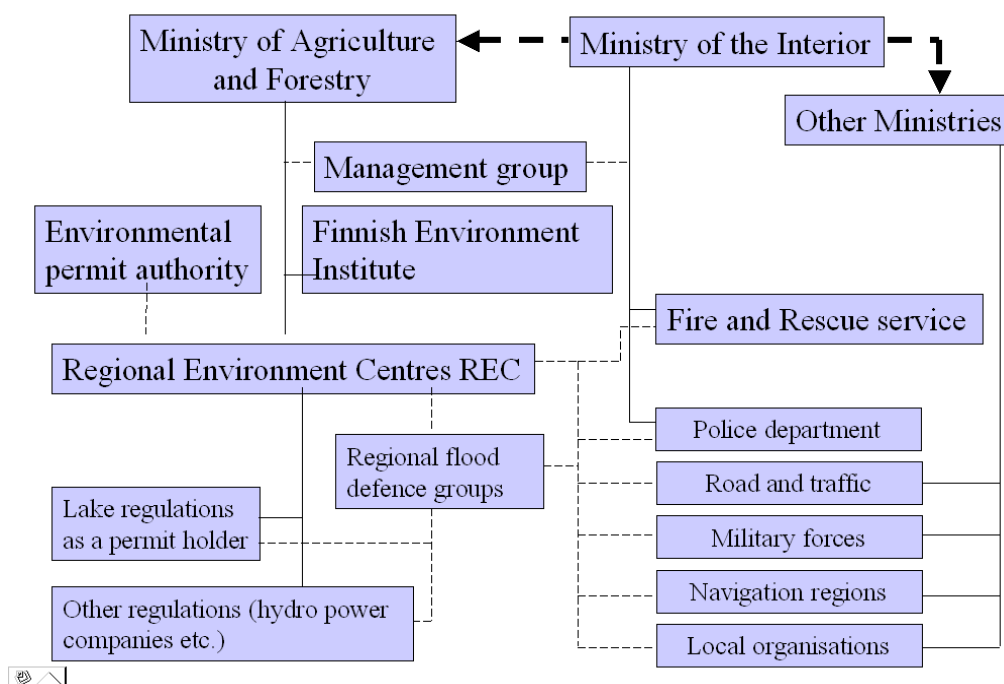
2. **NAME:**

3. **ADVANCED ASPECTS:**

Prime Minister's Office statute how to compensate crop damage. If more than 30 % of the crops is damaged then you can apply for the compensation. This renewed law considers also the quality of crops.

## 2. INSTITUTIONS INVOLVED

There are no special drought forces, but the Finnish flood defence organization which is presented below, is also involved in the case of drought.



## THE MAJOR INSTITUTIONS WHICH PLAY A ROLE IN COMBATING DROUGHT

### 1. NATIONAL LEVEL:

*The Ministry of the Interior:* It has the responsibility to lead and supervise rescue services in the national level.

*The Ministry of Agriculture and Forestry:* Is responsible of the use and management of water resources.

*The Ministry of the Environment:* It is responsible for ensuring that the environmental perspective is given proper consideration in international cooperation and society, and at all levels of government.

*The Ministry of Social Affairs and Health:* The Ministry directs and guides the development and policies of social protection, social welfare and health care. It defines the main course of social and health policy, prepares legislation and key reforms and steers their implementation, and handles the necessary links with the political decision-making process.

*The Emergency Center:* Receives the emergency calls and passes the information to other authorities such as the Fire rescues service, the police, the road and traffic organization and for the public radio and TV.

*The Fire and rescue service:* Is typically informed through the emergency center. It is responsible to establish the rescue organization and lead the necessary operations. They can for example transport water during a drought like happened in the drought of the years 2002 and 2003.

*The Public Radio and TV, YLE:* Passes the crisis information to the public whenever needed.

*The Finnish Environment Institute:* In case of an environment accident it contacts to the National Emergency Center. SYKE can send an expert to the site to investigate the environment catastrophe to estimate the potential damage and emergency help needed. SYKE also does hydrological forecasting in Finland (floods).

*The Finnish Meteorological Institute:* Does real time weather forecasting in Finland and predicts how different gases are spreading in the atmosphere. It also monitors forest fires.

*The Finnish Game and Fisheries Research Institute:* It produces high-quality scientific information about fisheries, game and reindeer for sustainable use of natural resources and helps maintain biodiversity through research and aquaculture.

### 2. REGIONAL LEVEL:

*The environmental municipal officials:* They supervise that the activities in the community are implemented according to the laws. They also give permits for some minor activities.

*Police department:* Receive a message typically from the emergency center. It can evacuate the area, keeps peace and works together with fire and rescue services. Also it is responsible for communication with other organizations.

### 3. OTHER INSTITUTIONS:

*The Regional Environment Centers:* Are basically preventing drought by admitting support to water and sup-ply systems. They also support the Fire and rescue services if needed. They also apply for special temporary permits to alleviate the negative effects of droughts (regulation permits etc.).

### 3. DATA AND INFORMATION SYSTEM

#### **THE INSTITUTIONS THAT COLLECT, RECORD AND PROCESS DATA THAT PROVIDE A REPRESENTATION OF NATURAL PROCESSES AND SOCIO-ECONOMIC PATTERNS DIRECTLY OR INDIRECTLY RELATED TO DROUGHTS**

##### 1. **NATIONAL LEVEL:**

- o The Statistics Finland
- o The Statistics Center of the Ministry of Agriculture and Forestry
- o Finnish Meteorological Institute
- o Finnish Environment Institute: hydrological database (HERTTA/HYDRO) includes hydrological data and metadata. Watershed Simulation and Forecasting System (WSFS) can be used for hydrological simulation and forecasting
- o The Finnish Game and Fisheries Research Institute: it compiles official statistics on hunting and the fisheries sector. Statistics are published in the Official Statistics of Finland (SVT) Agriculture, Forestry and Fishery Series.

##### 2. **REGIONAL LEVEL:**

The databanks of the regional environment centers.

##### 3. **OTHER INSTITUTIONS:**

The databanks of the communities.

### 4. PLANS AND ACTIONS IN DROUGHT MANAGEMENT

There are certain nationwide emergency plans for drought situations. At present there is a working group under the Ministry of Agriculture and Forestry for the planning of emergency actions to safeguard water supply and functioning of water works.

#### **MITIGATION ACTIONS**

##### 1. **NATIONAL LEVEL:**

##### 2. **REGIONAL LEVEL:**

##### 3. **OTHER INSTITUTIONS:**

#### **PLANNING METHODOLOGIES**

# ANNEX III - FRANCE REPORT

## INDEX

### 1. LEGISLATION / PUBLIC POLICY

#### **MAINS LAWS AND DECREES ISSUED ON WATER RESOURCES USE, FLOOD DEFENSE AND POLLUTION CONTROL**

DATE	N.°	NAME	NOTES
16 <sup>th</sup> December 1964	64-1245	Regime, distribution and water pollution control of waters	
29 <sup>th</sup> June 1984	84-512	Law relating to fresh water fishing and fish resources	
3 <sup>rd</sup> January 1992	92-3	Water Act	
24 <sup>th</sup> September 1992	92-1042	Décret portant application de l'article 5 de la loi n° 92-3 du 3 janvier 1992 et relatif aux schémas d'aménagement et de gestion des eaux.	
29 <sup>th</sup> January 1993	93-122	Prévention de la corruption et à la transparence de la vie économique et des procédures publiques (SAPIN Law)	
6 <sup>th</sup> April 1994	94-289	Décret relatif aux communautés locales de l'eau pris pour l'application de l'article 7 de la loi n° 92-3 du 3 janvier 1992	
2 <sup>nd</sup> February 1995	95-101	Renforcement de la protection de l'environnement (BARNIER Law)	
21 <sup>st</sup> April 2004	2004-338	Transposition de la directive 2000/60/CE du Parlement européen et du Conseil du 23 octobre 2000 établissant un cadre pour une politique communautaire dans le domaine de l'eau	

#### **LEGISLATIVE INNOVATIONS IN WATER AND DROUGHT MANAGEMENT**

1. **LAW N.°:** 64-1245

2. **NAME:** Regime, distribution and water pollution control of waters

3. **ADVANCED ASPECTS:**

This outline law and its application decrees instituted the principle of water management in its natural milieu.

France's territory was divided into 6 major hydrographic basins and for each of them it was created, as an executive organ for managing water resources, a Financial Basin Agency (later renamed Water Agency), to:

- implement at the scale of the basin, and involving all water stakeholders, a sustainable and coherent water management system, defined by national laws and regulations that also take account of European directives;
- insure the security of water supply;
- protect the natural heritage of the river environment;
- reduce repeated accidental pollutions;

- improve the efficiency of water works.

1. **LAW N.º: 92-3**

2. **NAME: Water Act**

3. **ADVANCED ASPECTS:**

- Water is a national heritage. Its protection and development as a usable resource is for the public interest.
- Management of water resources aims at ensuring:
  - the preservation of aquatic ecosystems and wet lands;
  - the protection and restoration of surface and underground water quality;
  - the development and quantitative protection of water resources to ensure public health, economic and leisure activities requirements.
- Dialogue must be the basis for any water management planning.
- Water has an economic value and we must be conscious that it can become a rare and expensive resource.
- Domestic wastewater collection and treatment will become compulsory nationwide by the year 2005.
- A protective perimeter must be created around each drinking water catchment basin.
- The role of water policy is strengthened.

This Water Act essentially reinforced the hydrographic division into large catchment basins. The 6 hydrographic basins are organized under the master plan called the SDAGE (Guideline water development and management scheme), which has the force of law and is the reference point for all decisions related to territorial development. Similarly, water management was locally organized around the SAGE (Water development and management scheme), drawn up by local water committees at each sub-basin level.

1. **LAW N.º:**

2. **NAME:**

3. **ADVANCED ASPECTS:**

2. **INSTITUTIONS INVOLVED**

**THE MAJOR INSTITUTIONS WHICH PLAY A ROLE IN COMBATING DROUGHT**

In France, management of surface and ground water, considered to be a "national common heritage", is based on six important fundamental principles:

- The geographic reality of large river basins must be taken into account as "water knows no administrative boundary";
- An integrated approach to meet all water use requirements while respecting aquatic ecosystems;
- Establishing partnerships and coordinating the actions of Public Authorities and developers: this is the role of the 6 river basin committees and of the Prefects basin coordinators;
- Mobilizing specific financial resources is the task of the six Water Agencies. The users-polluters have to pay as "water must pay for water";
- A multi-annual planning which defines priority investments within the framework of river leasing contracts and the Water Agencies' VI<sup>th</sup> programme;
- The respect of the competence of each private or public contracting authority in its specific sphere, within the collective framework defined by law.

Water Policy is defined by the State, in partnership with all local Communities and users - industrialists, large regional developers, farmers, suppliers, fishermen and fish farmers, associations for the nature protection - associated at every level, with a view to organize a global management of the resource, so as to ensure the optimal satisfaction of all requirements, while respecting aquatic ecosystems.

Dialogue is institutionalised at three levels.

### 1. NATIONAL LEVEL:

The **National Water Committee**, chaired by a member of the Parliament, is composed of representatives of the National Assembly and the Senate, and of important institutions and national federations involved. It is consulted on the trends of the national water policy and on drafts of legislative and regulatory texts.

### 2. REGIONAL LEVEL:

#### **Level of each of the six large River Basins:**

The **River Basin Committee**, chaired by a local elected official, plays a fundamental role as regards trends and incentives:

- a. After consulting regional, general and local Councils, it prepares and adopts the Master plan for Water Development and Management (SDAGE) which fixes for each basin or group of basins, the fundamental trends for a balanced, quantitative and qualitative water management.
- b. SDAGEs take into account the main programmes decided by public communities and define, in a general and harmonious manner, the objectives for water quantity and quality as well as the developments and improvements to be undertaken to attain them. They define the limits of the sub-basins corresponding to hydrographic units.
- c. The River Basin Committee is consulted by the Water Agency, set up in the river basin, on the rates and bases of water charges levied for water withdrawals and discharges. It is also consulted on the priorities of the Agency's 5-year action programmes and on the methods to aid investments and the smooth running of private and public wastewater treatment plants.

#### **Level of tributaries and sub-basins corresponding to a hydrographic unit or an aquifer:**

A **Local Water Commission** can be set up to prepare and follow up the implementation of the Water Development and Management Scheme (SAGE). It is composed by half of representatives of local communities, by a quarter of representatives of users and by a quarter of State representatives.

The Water Development and Management Scheme fixes the general objectives for the utilization, development and quantitative and qualitative protection of surface and groundwater resources, and aquatic ecosystems, as well as for the preservation of wetlands, in a manner which complies with the principles defined by law. Its area is determined by the Master plan. When no master plan exists, the State representative will take the decision after consulting or retaining proposals of the local communities and the River Basin Committee.

When the scheme has been approved, the decisions made by administrative authorities in the field of water, and applicable to the area it defines, must be consistent or made consistent with this scheme.

### 3. OTHER INSTITUTIONS:

The local communities involved, can associate themselves with a **Local Water Community** to help attain the objectives determined by the Water Development and Management Scheme.

The "Local Water Community" can be entrusted with the study, the completion and operation of all constructions, installations or equipments of an urgent or general character, aiming at:

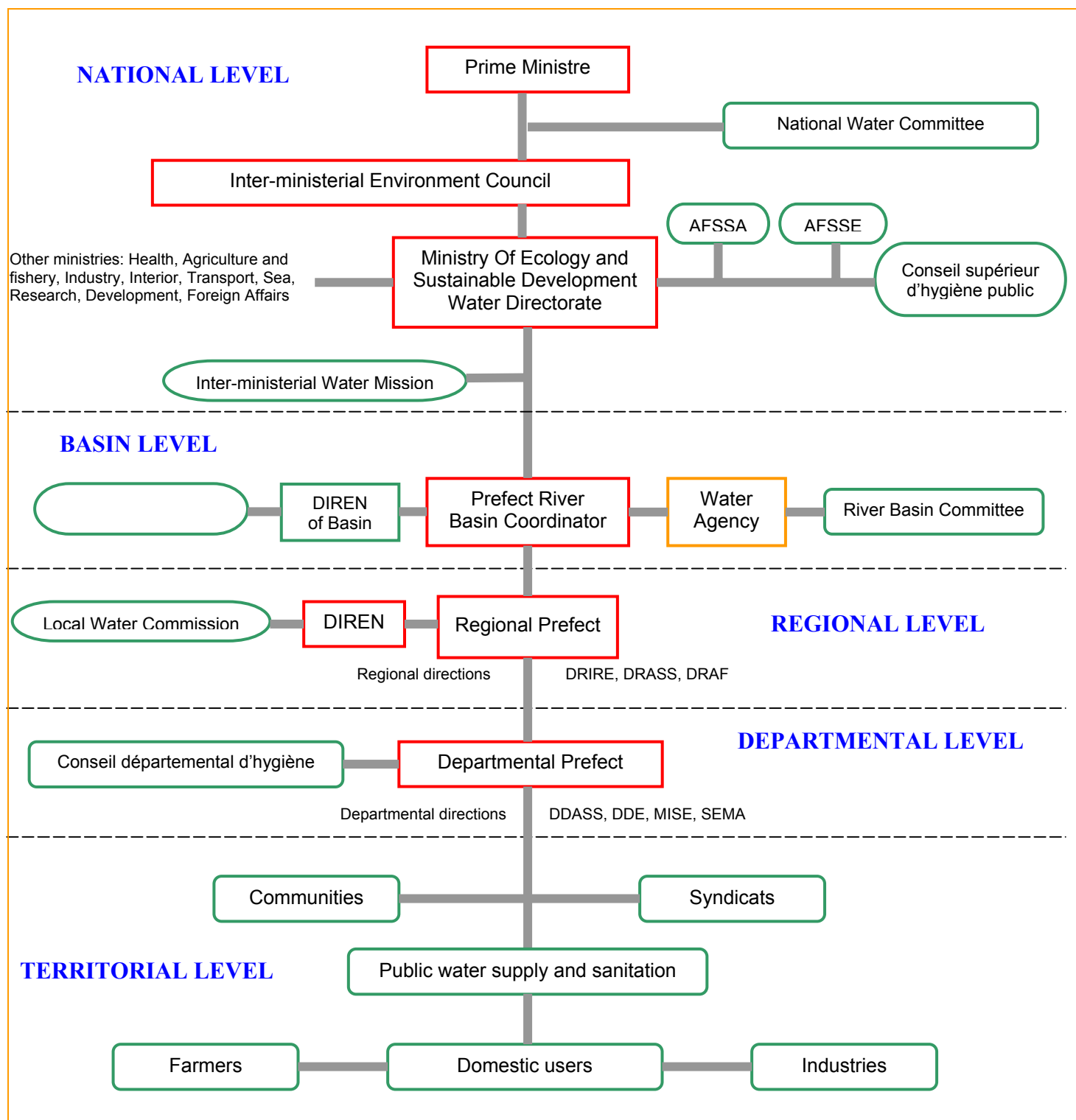
- developing a basin or part of a hydrographic basin,
- developing and maintaining a watercourse that is not managed by the State, including accesses,
- water supply,
- controlling stormwater and run-off,

- protecting against floods and the sea,
- controlling pollution,
- protecting and preserving surface and groundwater,
- protecting and restoring sites, aquatic ecosystems and wetlands as well as bordering woodlands,
- developing hydraulic works for civil defence.

Within the framework of the Water Law of 1964, a **Water Agency** was set up in each of the six river basins as an administrative public establishment endowed with a civil status and financial autonomy.

The aim of these agencies is to facilitate the various actions of common interest to the basin in order to reach a balance between water resources and requirements; to attain the quality objectives determined by regulations, to improve and increase the resources, as well as to control floods. The scope of action covers surface water, groundwater and territorial waters in the sea.





#### GLOSSARY

AFSSA:	Agence française de sécurité sanitaire des aliments
AFSSE:	Agence française de sécurité sanitaire environnementale
DIREN:	Direction régionale de l'environnement
DRASS:	Direction régionale des affaires sanitaires et sociales
DRIRE:	Regional Office of Industry, Research and the Environment
DRAF:	Direction régionale de l'agriculture et de la forêt
DDASS:	Direction départementale des affaires sanitaires et sociales
DDE:	Direction départementale de l'équipement
MISE:	Mission inter services de l'eau
SEMA:	Service eau et milieux aquatiques

### 3. DATA AND INFORMATION SYSTEM

**THE INSTITUTIONS THAT COLLECT, RECORD AND PROCESS DATA THAT PROVIDE A REPRESENTATION OF NATURAL PROCESSES AND SOCIO-ECONOMIC PATTERNS DIRECTLY OR INDIRECTLY RELATED TO DROUGHTS**

#### 1. NATIONAL LEVEL:

INSTITUTION	Type of data
THE MINISTRY OF ECOLOGY AND SUSTAINABLE DEVELOPMENT	

#### 2. REGIONAL LEVEL:

INSTITUTION	Type of data
THE WATER AGENCIES	

#### 3. OTHER INSTITUTIONS:

INSTITUTION	Type of data

### 4. PLANS AND ACTIONS IN DROUGHT MANAGEMENT

## MITIGATION ACTIONS

### *Before drought crisis periods = Anticipation*

- Alert indicators
- Scenarios
- Follow-up Committee
- Communication
- Drought management plan by framework decrees

Prefects as drainage area coordinators drive and coordinate state policy in control and management of basin water resources.

Prefects take  
**framework decrees**

on drainage area  
→  
to fix before drought event

Rules  
Limits  
Measures to take

### *Objectives:*

- o To guarantee uniqueness and coherence of state action
- o To consolidate basin coordination
- o To guarantee upstream/downstream solidarity
- o To make crisis management easier
- o To guarantee the principle of fairness between users

### *During drought crisis periods*

- Overcome of information and data circulation
- Crisis committees (national, drainage areas, regional)
- Communication
- Restrictions or suspension measures by prefect decrees in application of framework decree (for example: 50 % reduction of volumes attributed to irrigation)

#### 4. ACTIONS AT NATIONAL LEVEL:

#### 5. ACTIONS AT REGIONAL LEVEL:

## PLANNING METHODOLOGIES

## ANNEX IV - GREECE REPORT

### INDEX

#### 1. LEGISLATION / PUBLIC POLICY

##### **MAINS LAWS AND DECREES ISSUED ON WATER RESOURCES USE, FLOOD DEFENCE AND POLLUTION CONTROL**

DATE	N.º	NAME	NOTES
1986	46399/1352/1986	Joint Ministerial Decisions for the harmonization of the Greek legislation with EU Directives 75/440, 76/659 and 76/160	
1986	A5/288/1986	Joint Ministerial Decisions for the harmonization of the Greek legislation with EU Directives 78/659, 79/869 and 80/778	
1986	1650/1986	Law for the protection of the environment	
1987	1739/1987	Law for the Management of Water Resources	Despite the innovative and integrated approach introduced by this Law, its complexity made its full implementation in practice quite difficult.
1988	18186/271/1988	Joint Ministerial Decisions for measures and restrictions for the Protection of the Aquatic Environment	
2003	3199/2003	Law for the Protection and Management of Waters	It is based upon the principles of the European Directive 200/60/EC

##### **LEGISLATIVE INNOVATIONS IN WATER AND DROUGHT MANAGEMENT**

1. **LAW N.º:** 1739/1987
2. **NAME:** Law for the Management of Water Resources
3. **ADVANCED ASPECTS:**
  - Introduction of the River Basin Districts;
  - Concept of planning;
  - Responsible authorities according to the type of water use;
  - Administrative body for the application;
  - Cardinal role of the Ministry of Development;
  - Water use permit;
  - Preservation and protection of water resources;
  - Disposal of wastewater and industrial waste.
1. **LAW N.º:** 3199/2003
2. **NAME:** Law for the Protection and Management of Water
3. **ADVANCED ASPECTS:**
  - a. Radical reorientation of the respective administrative capacities;

- b. Innovative and holistic approach concerning water management that recognizes explicitly the ecological function of water;
- c. Management of water on river basin level as well as on water pricing so that it reflects its full costs;
- d. Introduction of the 'polluter pays principle' and the objective of maintaining or reaching a 'good ecological status' for all water resources through control of pollution by use of thresholds levels and standards;
- e. Innovative approaches concerning protection of water quantity and cooperation on trans-national level.

According to this Law, Regional Water Directories and Councils, supervised by the National Water Agency, will be established for each one of the 13 River Basin District/Water Region of the country, aiming at co-ordinating water policy activities and implementing specific Programmes of Measures and Action Plans for achieving the environmental objectives of the WFD for each RBD. Representation of interested parties in regional Water Councils ensures an active public involvement in the process.

Although there are no specific articles regarding drought mitigation, it is implied that the bodies responsible for the water resources management will be also responsible for drought issues.

- 1. **LAW N.º:**
- 2. **NAME:**
- 3. **ADVANCED ASPECTS:**

## 2. INSTITUTIONS INVOLVED

### **THE MAJOR INSTITUTIONS WHICH PLAY A ROLE IN COMBATING DROUGHT**

#### 1. **NATIONAL LEVEL:**

**The Ministry of Environment, Physical Planning and Public Works.**

*The Central Direction of Waters* have the following responsibilities:

- a. working out of national medium and long-term plans for the protection and management of waters;
- b. drawing up of the annual report to submit to the Parliament;
- c. coordination of the various state departments and public sectors and representation of Greece in the official bodies of the European Union;
- d. proposal of the general principles for water costing and pricing and supervision of their implementation;
- e. proposal of legislative and administrative measures for the protection and management of water;
- f. management of the hydrological and meteorological database on a National level and care for updating.

In the Central direction of Waters the *Consultative Committee of Waters* is constituted.

**The National Committee of Waters** is presided by the Minister of Environment, Physical Planning and Public Works and is responsible for the following:

- g. planning of the policy for the protection and the management of waters;
- h. approval of the national plans for the protection and management of the water potential of the Country.

Its members are the Ministers of Economy and Finance, of Interior Affairs, Public Administration and Decentralization, of Development, of Health and Welfare, of Agriculture. Other Ministers may participate when issues of their responsibilities are in the agenda. The Minister of Foreign affairs participates when issues about international waters were discussed.

The National Committee of Waters may form consultative-scientific committees when needed and submits an annual report to the Parliament and to the National Council of Waters.

**The National Council of Waters** is constituted, presided also by the Minister of Environment, Physical Planning and Public Works. Members of this Council are representatives of stakeholders, i.e. political parties represented in the Parliament, prefecture representatives, municipal unions and companies, unions of workers, scientific organizations and two non-governmental organizations. It is a consultative body and reports to the National Committee of Waters.

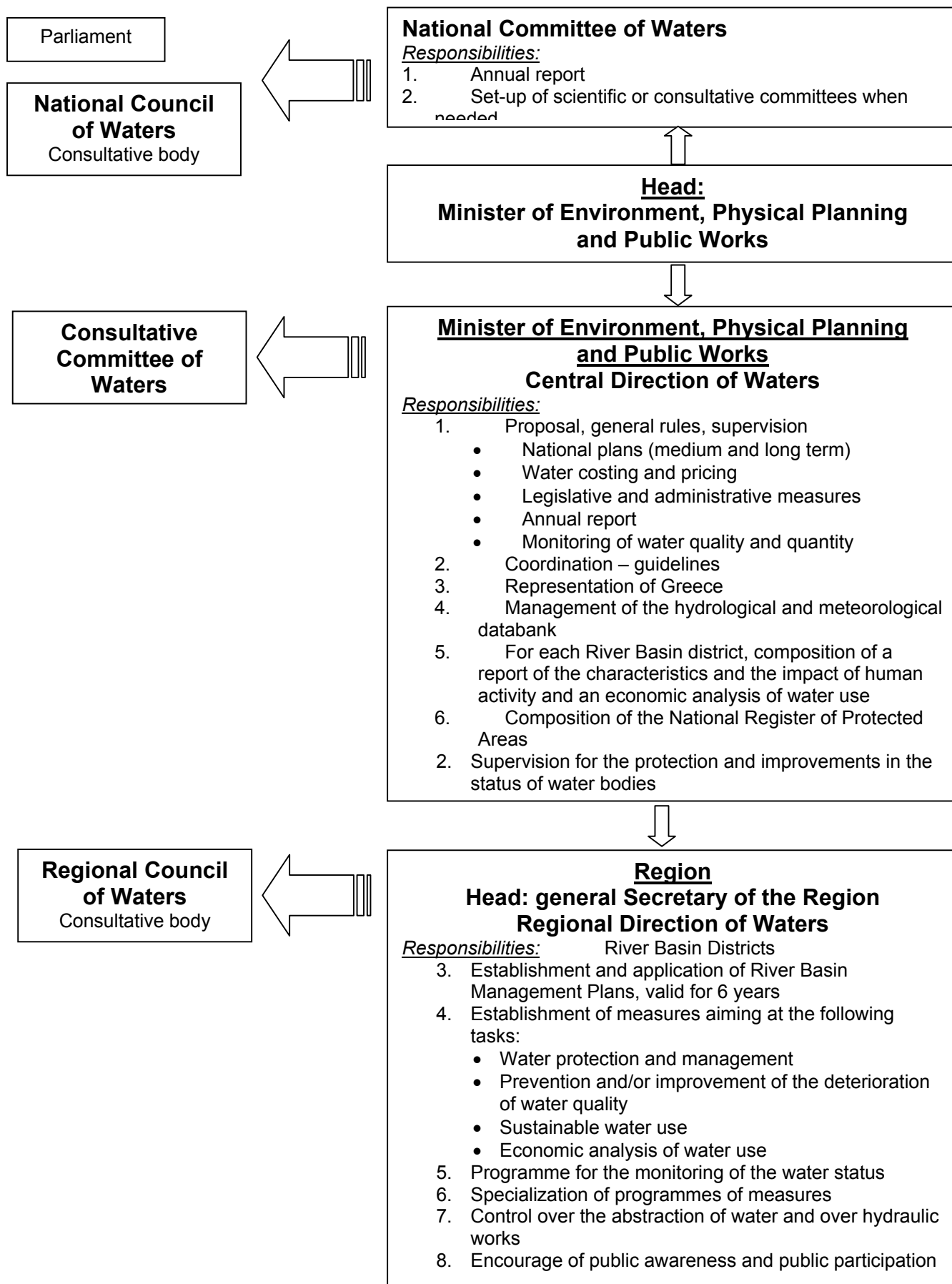
## 2. REGIONAL LEVEL:

Regions are responsible for the protection and management of each River Basin District. In each Region is constituted the **Regional Direction of Waters**, having as responsibilities:

- i. the specialization of the appropriate measures that have to be taken for the integrated protection and management of the River Basin Districts.
- j. the specialization and application of medium long-term programs for the protection and management of the River basin Districts;
- k. the establishment of measures necessary for the economic analysis of water use;
- l. the control over the abstraction of fresh surface water and groundwater and over hydraulic works developed for the exploitation of water;
- m. the establishment and application of River Basin Management Plans;
- n. the encouragement of public participation.

In each Region is constituted also the **Regional Council of Waters**, presided by the General secretary of the Region. This is a consultative body and acts as a link for the promotion of public involvement and participation in the protection and management of waters.

## 3. OTHER INSTITUTIONS:



### 3. DATA AND INFORMATION SYSTEM

#### THE INSTITUTIONS THAT COLLECT, RECORD AND PROCESS DATA THAT PROVIDE A REPRESENTATION OF NATURAL PROCESSES AND SOCIO-ECONOMIC PATTERNS DIRECTLY OR INDIRECTLY RELATED TO DROUGHTS

##### 1. NATIONAL LEVEL:

INSTITUTION	Type of data
THE MINISTRY OF ENVIRONMENT	Water quality Water use Geographical data Land use
THE NATIONAL METEOROLOGICAL SERVICE	Meteorological data
THE MINISTRY OF AGRICULTURE	Meteorological data Water quality Water use Agricultural census
THE MINISTRY OF INTERIOR	Municipal water consumption
THE MINISTRY OF DEVELOPMENT	Land use Population Groundwater
THE NATIONAL OBSERVATORY OF ATHENS	Meteorological data
THE ARMY GEOGRAPHICAL AGENCY	Maps Topography Land use GIS
THE CENTRE OF PLANNING AND ECONOMIC RESEARCH	Socio-economic indicators
THE INSTITUTE OF GEOLOGY & MINERAL EXPLORATION	Groundwater Land use Geology
THE PUBLIC POWER CORPORATION	Energy consumption
THE NATIONAL STATISTICAL SERVICE	Statistics Macroeconomic indicators

##### 2. REGIONAL LEVEL:

INSTITUTION	Type of data

##### 3. OTHER INSTITUTIONS:

INSTITUTION	Type of data
THE WATER SUPPLY COMPANIES	Water quality Water use



#### 4. PLANS AND ACTIONS IN DROUGHT MANAGEMENT

##### **MITIGATION ACTIONS**

Specific measures of drought mitigation have not been legislated in the past in Greece. However in 1994 Greece signed the Desertification Convention of the United Nations, which was ratified by the Greek Parliament in 1997.

Given that agriculture uses 84% of the water resources of Greece, most pro-active actions concerning the effects of droughts were taken in the past by the Ministry of Agriculture.

##### Pro-active actions

- 1) small earth dams for collection of rainwater
- 2) canal rectification to reduce water losses
- 3) modernization and improvements of irrigation networks

In more detail, all proactive measures have the same aim to enhance the storage, the conveyance and distribution of water. In this context, it should be mentioned that important contribution to water saving is the gradual change from conventional surface irrigation systems to modern sprinkler and trickle irrigation systems.

##### Re-active actions

- 2) constraints in water consumption
- 3) intensification of the use of groundwater resources
- 4) relocation of water resources
- 5) use of saline and brackish waters
- 6) water transfer

During drought, the re-active actions follow two categories of measures: the allocation of new sources of water, such as saline and brackish waters and also intensive pumping of existing groundwater. In some cases water also is transferred from users to the towns and cities for municipal consumption.

##### **ACTIONS AT NATIONAL LEVEL:**

- a. The repairing and renovating the irrigation networks;
- b. The application of integrated irrigation systems;
- c. The water re-usage
- d. The construction of dams and off-stream reservoirs in drought prone areas

##### **ACTIONS AT REGIONAL LEVEL:**

- The establishment and operation of the regional water management services;
- The issue of regulation decisions by prefectures to protect water resources per water basin;
- A more efficient operation of Local Land Reclamation Organization

##### **PLANNING METHODOLOGIES**

Within the implementation of the Desertification Convention of the United Nations, the National Committee to Combat Desertification (NCCD) has been established and finally in 2002 the **Greek National Action Plan (NAP)** for combating desertification has been developed. The Greek Government accepted officially the National action Plan in July 2001, through a Common Ministerial Decision (CMD) of six involved Ministers. The CMD was published in the Government's Gazette n° 974/27-7-2001.

Within this Plan, the institutional and legal measures related to water resources and more specifically the mitigation of drought, are covered by the EU Directive 2000/60 and the new Greek Water Law. Particularly, measures planned that are compatible with the NAP, are:

- A programme for the management of water resources and the development of institutional structure for the period of 2001 – 2006;

- The implementation of the plans for developing water resources at all levels;
- The development and expansion of the National Data Bank of Hydrological and Meteorological Information;
- The support of research for increasing available water supply.

## ANNEX V - ITALY REPORT

### 1. LEGISLATION / PUBLIC POLICY

#### MAINS LAWS AND DECREES ISSUED ON WATER RESOURCES USE, FLOOD DEFENCE AND POLLUTION CONTROL

DATA	N.°	NAME	NOTE
11/12/1933	<i>R.D. 1775/33</i>	water licenses and hydropower	G.U. 8 january 1934 n.5
13/02/1933	<i>R.D. 215/33</i>	integrated land reclamation	
19/03/1952	<i>LAW 184/52</i>	river regulation plan	
04/02/1963	<i>LAW 129/63</i>	drinking water supply master plan	
15/1/1972	<i>D.P.R. 8/72</i>	transfer to regions of responsibilities in water fields	
22/07/1975	<i>LAW 382/75</i>	transfer to regions of responsibilities in water fields	
10/05/1976	<i>LAW 319/76</i>	water pollution control	abrogated by 152/99
04/02/1977	<i>DEL.C.I 04/02/1977</i>	guidelines for sewage, wastewater treatment and discharge	
04/02/1977	<i>DEL.C.I. 4/02/1977</i>	criteria for rational water use and aqueducts operation	
24/07/1977	<i>D.P.R. 616/77</i>	transfer to regions of responsibilities in water fields	
23/04/1981	<i>LAW 153/81</i>	charges for sewage and wastewater treatment	
03/07/1982	<i>D.P.R. 470/82, D.P.R. 515/82, D.P.R. 236/82</i>	acknowledgement eec directives on water quality (76/160, 75/440, 80/778)	
08/07/1986	<i>LAW 349/86</i>	institution of environment ministry and eia	
24/05/1988	<i>D.P.R. 236/88</i>	quality of water for municipal use	
10/08/1988	<i>D.P.C.M. 337/88</i>	eia procedures for major works	
18/05/1989	<i>LAW 18 MAGGIO 1989, N. 183</i>	regulating soil conservation and water supply	g.u. 25 may 1989, n. 120, update to d.lgs. 30 july 1999, n. 300
08/06/1990	<i>LAW 142/90</i>	local authorities autonomy regulation	
25/01/1992	<i>D.L. 130/92, 132/92, 133/92</i>	acknowledgement of eec directives on water quality (76/464, 78/659, 80/68)	abrogated by 152/99
24/02/1992	<i>LAW 24 FEB 1992, N. 225</i>	regulating the Civil Protection Service	
03/04/1993	<i>D.L. 96/93</i>	management of water works	
12/07/1993	<i>D.L. 275/93</i>	modification of water license rules	
05/01/1994	<i>LAW 5 GENNAIO 1994, N.36</i>	municipal water supply reform	update to d.lgs 11 may 1999 n. 152, s.o. n.11 g.u. 19 january 1994, n. 14
05/01/1994	<i>LAW 5 GENNAIO 1994, N.37</i>	environmental protection of state property close to public water bodies	
21/01/1994	<i>LAW 61/94</i>	institution of environmental protection agency	

17/05/1995	<i>LAW 172/95</i>	revision of L. 319/76 procedures	abrogated by 152/99
18/07/1995	<i>D.P.R. 18/07/1995</i>	approval of address act for the definition of the basin plan	
04/03/1996	<i>D.P.C.M. 04/03/1996</i>	directives on water resources	
12/04/1996	<i>D.P.R. 12/04/1996</i>	eia procedure enlargement	
08/01/1997	<i>D.LL.PP. 99/97</i>	criteria for losses evaluation in aqueducts and sewers	
14/02/1997	<i>D.LL.PP. 14/02/1997</i>	directives for the identification of areas subject to hydrogeologic risk	
04/06/1997	<i>LAW 4 GIUGNO 1997 N. 170</i>	ratification and execution of the United Nations convention on combating desertification in countries severely hit by drought and/or desertification, particular in Africa, with annexes, made in Paris 14 October 1994	g.u. n.142 of 20 June 1997
26/09/1997	<i>DPCM 26/9/1997</i>	establishment decree of the national committee for combating drought and desertification	
03/08/1998	<i>LAW 267/98</i>	actions for coping with hydrogeological risk	
29/09/1998	<i>D.P.C.M. 29/09/1998</i>	criteria for areas under hydrogeological risk	
09/12/1998	<i>LAW 9 DECEMBER 1998, N. 426</i>	new interventions in environmental sphere (art.4)	g.u. n. 291 of 14 December 1998
22/12/1998	<i>DEL. CIPE N. 154/98</i>	first national communiqué in fulfilment of the United Nations convention for combating drought and desertification	g.u. n. 39 of 17-02-1999
18/02/1999	<i>D.P.R. 238/99</i>	declaration of all water as public	
26/03/1999	<i>LAW 26 MARCH 1999 N° 107</i>	ratification and execution of the agreement between the government of the Italian Republic and the secretariat of the United Nations convention for combating desertification, made in Paris 14 October 1994, and the FAO, for the carrying out of the first session of the conference of the parties to the same convention, with annexes, made in Rome 30 June 1997	g.u. 23 April 1999 n.94 s.o. n.80
29/04/1999	<i>D.P.C.M. 29/04/1999</i>	chart for water supply service	
11/05/1999	<i>D.LGS. MAY 1999 N.152</i>	regulations on the safeguard of waters from pollution	test coordinated with d.lgs. 18 August 2000, g.u. n.246 of 20 October 2000 s.o. n.172
17/08/1999	<i>LEGGE 290/99</i>	deadline extension for wells declaration	
03/12/1999	<i>D.P.R. 3 DECEMBER 1999, N.549</i>	regulation bearing organizational rules of the structures of general managerial level of the ministry of the environment	g.u. n. 67 of 21-03-2000
21/12/1999	<i>DEL. CIPE N.229/99</i>	national programme for combating drought and desertification	
22/03/2000	<i>D.M. N.5173 DEL 22.03.2000</i>	MINISTRY OF AGRICULTURAL AND FOREST POLICIES constitution of the technical scientific advisory committee for sustainable agriculture D.M. 9/2000 – MINISTRY OF AGRICULTURAL AND FOREST POLICIES composition technical scientific advisory committee for sustainable agriculture	
18/08/2000	<i>D.LGS. 18 AUGUST 2000, N.258</i>	corrective and supplementary regulations of the legislative decree 11 May 1999, n. 152 concerning safeguard of water from pollution, according to art.1, paragraph 4, of the law 24 April 1998, n.128	

18/08/2000	<i>D.L. 267/2000</i>	organisation of local authorities	
02/02/2001	<i>D.L. 31/01</i>	acknowledgement eec directive 98/83	
23/03/2001	<i>LAW 23 MARZO 2001 N°93</i>	regulations in environmental field (art.17)	
27/03/2001	<i>D.P.R. 27 MARCH 2001 N.178</i>	regulation of the organization of the ministry of environment and protection of the territory	g.u. n. 114 of 18-05-2001
03/05/2001	<i>DEL. CIPE 3 MAY 2001</i>	allocation of resources for the functioning of the national committee for combating drought and desertification (law 23 March 2001, n.93)	
04/09/2001	<i>D.P.C.M. 4 SEPTEMBER 2001</i>	delegation of the functions relating to services technical national to the minister of the environment and protection of the territory	g.u. n. 219 del 20 September 2001
02/02/ 2002	<i>D. Lgs. n. 27/02</i>	amendments and supplements to the legislative decree 2 February 2001, n. 31, according to the directive 98/83/CE relative to the quality of water for human consumption	G.U. n. 58 of 9-3-2002
11/03/2002	<i>LAW 11 MARCH 2002, n. 40</i>	ratification and execution of the amendments to article XXI of the Convention on the International Hydrographical Organization, adopted in Monaco during the course of the Conference held from 14 to 25 April 1997	Published in GU n. 72 of 26-3-2002
28/03/2002	<i>DEL.CIPE N.16/2002</i>	funds for the promotion of sustainable development: activity programme for the financial year 2001	gu n.167 of 18 July 2002
14 /06/2002	<i>DEL. 14 JUNE 2002, n. 41</i>	Interministerial Committee for Economic Programming. Guidelines for the national programme for water supply in agriculture and for the development of irrigation	GU n. 199 of 26-8-2002
02/08/2002	<i>DEL. CIPE N. 57/2002</i>	Environmental action strategy for sustainable development in Italy	gu n.255 of 30 October 2002
29/09/2002	<i>DEL. CIPE 29 SEPTEMBER 2002</i>	Funds for the promotion of sustainable development: amendments to the activity programme for the financial year 2001	gu n.280 of 29 November 2002
06/12/2002	<i>D.LGS. 6 DECEMBER 2002, N.287</i>	Amendments to legislative decree 30 July 1999, n.300 concerning the organisational structures of the ministries, as well as the tasks and functions of the Ministry of the Environment and Protection of the Territory	g.u. n.304 of 30 December 2002
12/12/2002	<i>ACCORDO 12 DICEMBRE 2002</i>	Permanent conference for the relations between the State and the Regions and the Autonomous Provinces. Guidelines for the safeguard of water quality for human consumption and general criteria for the identification of conservation areas of water resources referred to in art. 21 of the legislative decree 11 May 1999, n. 152	GU n. 304 of 30-12-2002
12/06/2003	<i>D. 12 GIUGNO 2003, n. 185</i>	Ministry of the Environment and Territorial Protection. Regulation bearing technical rules for the re-use of wastewater in fulfilment of art. 26, paragraph 2, of the legislative decree 11 May 1999, n. 152	GU n. 169 of 23-7-2003
27/02/2004	<i>D.P.C.M. 27 FEBBRAIO 2004</i>	operative guidelines for the organisational and functional management of the national and regional warning system for hydrogeological and hydraulic risk aimed at civil defence	GU n. 59 of 11-3-2004-Suppl. n.39

## LEGISLATIVE INNOVATIONS IN WATER AND DROUGHT MANAGEMENT

LAW N° \_\_\_\_\_ 183/89 \_\_\_\_\_

NAME \_\_\_\_\_ regulating soil conservation and water supply \_\_\_\_\_

### ADVANCED ASPECTS:

The Law 183/89 on water and soil conservation is aimed at adopting an integrated approach to water and land conservation problems. Both planning and management of water and land conservation must be conceived within a single vision for the whole territory of each hydrographic basin. It introduced the concept of River Basin Plan, which was conceived as the main tool to collect relevant information and to identify the actions necessary for hydraulic defence and soil conservation, utilization of water resources, and pollution control of water bodies.

The law established that River Basin Authorities be entrusted with the coordination of all the planning, construction and control activities in water fields within the river basin.

Furthermore, it has reformed the National Technical Services, transferred under Prime Ministerial jurisdiction, assigning also the task of organising and managing the Information System on hydrometeorological data. Later on, three Technical Services were transferred to various Ministries (e.g. Hydrographic Service to Environment Ministry, Dams Service to Infrastructure Ministry)

LAW N° \_\_\_\_\_ 225/92 \_\_\_\_\_

NAME \_\_\_\_\_ regulating the Civil Protection Service \_\_\_\_\_

### ADVANCED ASPECTS:

With the law n.225 of 24 February 1992, Italy has organized the civil defence as a National "Service", coordinated by the Prime Minister's Office and composed, as stated in the first article of the law, by State administrations, central and peripheral, by the regions, by the provinces, by the local councils, by the national and territorial public authorities and by every other institution and organization, public and private, existing on the national territory.

The Department of Civil Defence intervenes, jointly with the competent Ministries and with the Regions involved, in events that, due to intensity and extension, must be faced with exceptional means and powers. It prepares, jointly with the Regions and local institutions, water emergency plans and gives guidance to Commission delegates for the destination of the available resources. Lastly, with the D.P.C.M. n.59 of 27/02/2004, the authorities are identified to which lies the decision and responsibility of alerting the civil defence system at various levels, the institutional bodies and the territorial units involved in the activity of forecast and prevention of risk and emergency management are defined and the tools and modalities with which the information relative to the manifestation and evolution of the hydrogeological and hydraulic risk, associated to the manifestation of particularly intense meteorological events have to be recorded, analysed and made available to the authorities

LAW N° \_\_\_\_\_ 36/94 \_\_\_\_\_

NAME \_\_\_\_\_ municipal water supply reform \_\_\_\_\_

### ADVANCED ASPECTS:

The Law 36/94 has removed the exceptions to the general principle that all surface and groundwater resources must be considered public, and has introduced important innovations asserting that water resource use must accomplish criteria of efficiency and effectiveness, also taking into account criteria of solidarity and environmental protection. Besides, the law confirms that the management of the infrastructures pertaining to water (water mains, sewers, treatment plants) must be traced to single management at a level of optimal territorial area (ATO) and the land reclamation consortia are responsible for construction and management of water networks for irrigation purposes, for the reuse of treated wastewater, and for rural water mains. Law 36/94 has been followed by decree 47/96, that issued some guidelines for the identification of the areas under risk of water crisis, unfortunately not yet accomplished.

LAW N° \_\_\_\_\_ 152/99 \_\_\_\_\_

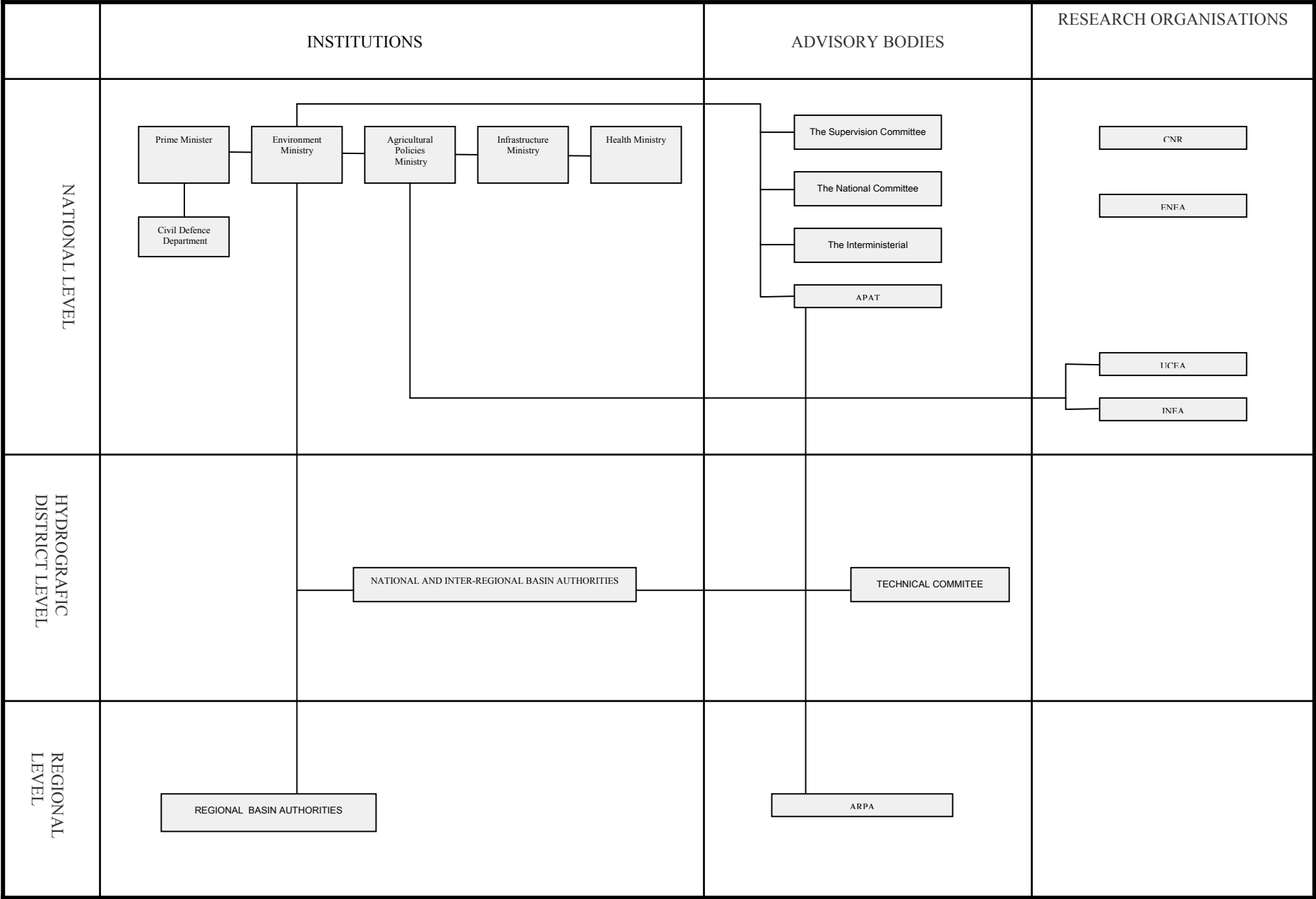
NAME \_\_\_\_\_ regulations on the safeguard of waters from pollution \_\_\_\_\_

#### ADVANCED ASPECTS:

The Legislative Decree 152/99 (amended by Legislative Decree 258/2000) has been conceived in order to adopt into Italian legislation the European directives 91/271 on urban wastewater treatment and 91/676 on protection of water from agricultural pollution. It also rearranged all previous Italian legislative framework on pollution control, replacing the fundamental law n.319/86 (Merli act).

Finally, it has defined the stages for achieving environmental quality objectives, including the analysis of present conditions and classification of environmental status, the identification of restoration objectives and the implementation of the necessary actions in water bodies.

THE MAJOR INSTITUTIONS WHICH PLAY A ROLE IN COMBATING DROUGHT





## **2. THE MAJOR INSTITUTIONS WHICH PLAY A ROLE IN COMBATING DROUGHT**

### **NATIONAL LEVEL:**

#### **1. Prime Minister's Office**

##### **1.1 Civil Defence Department**

On the base of the law n.225 of 24 February 1992, "Establishment of the National Civil Defence Service", the activities and civil defence tasks, coordinated at central level by the Department of Civil Defence of the Prime Minister's Office, are those aimed at:

- the study and determination of the causes of disastrous phenomena, natural or connected to human activity, the identification of risks and the evaluation of the consequent effects, the localising of the areas of the national territory which could be concerned by such events;
- the containment or elimination of the possible causes which can determine an emergency situation, among which also that of water, with the consequent involvement of people, property and environment ;
- assure the people affected by a state of emergency every form of initial assistance;
- overcoming the emergency by implementing those initiatives necessary and unable to be delayed in order to remove the obstacles to the resumption of normal living conditions.

The Civil Defence Department jointly sets up with the Regions and local bodies, water emergency plans and gives guidance to Commission delegates for the destination of available resources: the maximum priority must be given to human and animal use, then to public use, agricultural and zootechnic use and industrial use, encouraging, nevertheless, the totality and functioning of production plants and existing levels of employment.

#### **2. Ministry of Environment**

In the 1986 Italy establishes a Ministry of the Environment, charged with coordinating government activities. Later the government delegates certain implementation duties regarding land and water management and industrial pollution to the country's regional legislatures.

It discharges guiding action and coordination in the management of water resources through the Directorate for the Quality of Life, which deals with the implementation of the regulations relating to use of water and defence against flooding, from pollution, management of integrated water service, and programming of the relative financial resources.

The same Direction is furthermore the organ which sees to the issuing of concessions for large diversions of water and coordinates the allocation of funds to the peripheral offices of the Ministry for works and hydraulic maintenance. The peripheral offices take care of the preliminary investigations, requests for concessions for large diversions of water and sees to the execution of the hydraulic works in the principal areas of the basins of national importance in the centre-south: Arno, Teber, Liri - Garigliano and Volturno.

The Minister for the Environment is responsible for the preparation of the Report on the state of the environment, for issuing directives on rational use of water and on reuse of treated wastewater.

Under the authority of the Ministry there are:

##### **2.1 The Supervision Committee on the Use of Water Resources**

With the aim of guaranteeing the compliance of the rules that govern the integrated water supply and the fixing of tariffs, by means of a standardized methodology, the Law n. 36 of 5.1.1994 was introduced. It is the institutional organ of reference of the users and submits to Parliament an annual report. For its effectiveness the Committee has recourse to a Technical Secretariat and an Observatory which performs functions of collection, elaboration and restitution of statistical and cognitive data.

##### **2.2 The National Committee for Combating Drought and Desertification**

It has been introduced with DPCM 26-9-1997 at the Ministry of the Environment and coordinates the implementation at national level of the United Nations Convention on combating drought and/or desertification (UNCCD) in countries severely struck, particularly in Africa.

Italy, and the countries of the northern Mediterranean make up within the UNCCD a regional group (annex IV) which proposes to identify common policies on combating desertification, in the context of the EU strategy. The presidency of annex IV has been assigned to Italy, with the task of coordinating the preparation of the regional plan.

The National Committee, in its sitting of 22 July 1999, approved the guidelines of the national action plan for combating desertification, where the sustainable management of the water resources represents one of the four important sectors of intervention, directed primarily at safeguarding water, the control of water demand, of the extraction and of outlets, the reduction of wastage and leaks, the rationalisation of irrigation activities, incentive to research into multiple uses of water, the development and reuse of wastewater in agriculture, the expansion of prevention schemes, mitigation and adaptation of the effects of drought events.

### **2.3 The Interministerial Commission for Water Policy in the Mediterranean**

This was introduced with D.P.C.M. of 24/3/77. The Commission is made up of representatives from the Ministry of Public Works, Environment, Agriculture and Forests, Foreign Affairs and Department of National Technical Services of the Prime Minister's Office. It is charged with the task of establishing the National Focal Point for water in the sphere of the Euro-Mediterranean system for the exchange of information in the water sector (SEMIDE) and to follow the developments of water policy as well as proposing direct initiatives.

The Commission issues a six monthly report on the activities it has carried out to the Prime Minister's Office.

Under the supervision of the Ministry, the Agency for Environmental Protection and Technical Services (APAT) operates:

### **2.4 APAT**

The operation of APAT at peripheral level is assured by regional agencies (ARPA), set up autonomously by the single Regions; for information on the qualitative state of water bodies, it resorts to the SINA network (National Information System on Environmental Monitoring), made up of about 400 qualitative monitoring stations located on the national territory and 8000 monitoring stations on the water cycle (hydro-meteo-pluvio parameters).

## **3. Agricultural Policies Ministry**

In accordance with DLgs n. 300, of 30/7/1999, the Ministry has jurisdiction of general control and national coordination regarding large infrastructure networks of irrigation declared of national importance, as well as regarding special intervention in the south and of the Agency for the promotion of the development of the South (ex Agensud).

With Ministerial Decree n. 5173 of 22 March 2000 the Technical Scientific Consulting Committee was set up at the Ministry of Agricultural and Forest Policies for sustainable agriculture within which thematic working groups have been formed among which that of desertification.

Also the research and experimental institutes of the Ministry have technical-scientific jurisdiction in the water resources sector.

## **4. Ministry of Infrastructure**

Within the Ministry the General Direction for networks performs the jurisdictional functions of the Ministry in the following areas:

- a) monitoring of the electrical, water, hydraulic and water supply networks and relative technical coordination;
- b) fixing of water tariffs supplied through water mains;

- c) planning and management of national networks;
- d) planning, financing, implementation and management of the electrical, water, hydraulic and water supply networks in undeveloped areas;
- e) surveillance of the Italian reservoir Register;
- f) necessary and consequent works for the issuing of concessions for large diversions of water.

While the General Direction for the European programmes assures:

- a) the management of Interreg, Interreg II, Interreg III community initiative programmes
- b) exercise of tasks relative to the activity of management and payment and to the technical secretariat of programmes entrusted to Italy;
- c) management of community initiative programmes referred to in art. 10 of FERS regulations;
- d) participation in ONU-ECE, CEMIT-OCSE, CDS-CSRR international work groups;
- e) monitoring of initiatives, programmes and interventions.

The High Council of Public Works as “highest technical-advisory organ of the State on the subject of public works” is currently divided into six sections. In particular the 2nd and 4th Sections regard respectively: Hydrogeology, Geotechnics, Consolidation and shifting of built up areas, Irrigation reclamation, Hydraulic-forest arrangement, Safeguarding of water quality, Water supply systems and sewers and Dams, Energy Production Plants, Transport lines and Distribution of electrical energy, Use of public and groundwater.

## **5. Ministry of Health**

Water destined to human consumption.

The Ministry of Health, is divided into the following departments:

- a) department of quality.
- b) department of innovation.
- c) department of prevention and communication.

The last department attends to the activities of coordination and supervision and to direct intervention of State concern in regard to the health protection, environment and living conditions and to the well being of people and animals, as well as to information and communication to stakeholders and citizens and to internal and international institutional relations

Within the scope of this department the general directions have been set up among which the general direction for health protection which, apart from other functions, performs that related to hygiene-sanitary characteristics of water.

The obligatory controls which the Dlgs 31/01 envisages are of two types :

- external controls, under the jurisdiction of the ASL, aim at ascertaining the quality of water distributed for human consumption. In the case of water supply of unsatisfactory quality, it adopts the necessary measures to safeguard public health and, in any case, to apply the due sanctions.
- internal controls which the managing authority of the water supply network (or the owner of the food company) is obliged to carry out in order to check and guarantee himself the potability of the water which is distributed to the population (or uses as ingredient in the production cycle of foods and drinks).

The water supply networks must be equipped with an internal laboratory for the analytical control of the parameters of the purification cycle (art. 7). The law also permits the use of specialized external laboratories either entirely or in part.

### **Swimming Water.**

The operation of the surveillance programme on swimming water is regulated by D.P.R. 470/82, and subsequent amendments (L. 422/00). It consists of a cycle of activities which continues throughout the course of the year, even if it's peak coincides with the swimming season.

## RESEARCH ORGANISATIONS

### **1. CNR, Italian National Research Council**

CNR is defined as a "national research organization, with general scientific competence and with scientific research institutes distributed throughout Italy, which carry out activities of primary interest for the promotion of science and the progress of the country".

For more than 30 years the major part of research in the field of water quality has been carried out by the Institute of Research on Water (IRSA). This long period has been characterized by scientific commitment, collaboration with State Administrations for the solution of critical problems, for the updating of regulations, and with industry for the promotion of technological progress.

A significant role has been carried out in recent years by the National Defence Group against Hydrogeological Disasters, which exercises coordination action of research aimed at soil protection, control of extreme events of flood and low water and at the evaluation of vulnerability of groundwater.

In the field of research in the sector of lakes the Italian Institute of Hydrobiology with its office at Pallanza on Lake Maggiore holds a position of international prestige.

### **2. ENEA, Italian National Agency for New Technologies, Energy and the environment**

ENEA, the Italian National Agency for New Technologies, Energy and the Environment is a public undertaking operating in the fields of energy, the environment and new technologies to support competitiveness and sustainable development.

The "Combating desertification" group of ENEA has as objective the study of the impact of productive activities on the ecosystem, which represents, together with climate change, the principle critical element for triggering the desertification processes in the Mediterranean basin; the quali-quantitative evaluation of the desertification phenomenon through the utilization of parameters, indicators and indices of environmental and managerial quality; the study of possible interventions of adjustment, mitigation and recovery of the sustainability of the use of natural resources available on the territory.

The main lines of activity are the following:

1. Integrated research for the application of innovative technologies and processes for combating desertification;
2. Application of the UNO (United Nations Organization) Convention on "combating drought and desertification";
3. Research aimed at supporting the Regions in intervention projects.

It participates in community projects RIADE and DESERTNET.

### **3. UCEA**

The central office of Agricultural Ecology (UCEA) is the scientific and technical organ of the Ministry for Agricultural and Forest Policies which operates in the field of agrometeorology. Among the services provided is the collection of meteorological data for agricultural purposes. Through the "Observatory for Meteorological Adversity", programme activity being finalized, it is proposed to identify and describe meteorological conditions which, departing significantly from the norm, could have repercussions on the production or on the agricultural activity in a broad sense.

With this objective a bulletin is issued every ten days on drought and meteorological anomalies in collaboration with the CONSORZIO ITA and with FINSIEL.

### **4. INEA**

This institute carries out activities of research, survey, analysis and forecast in the structural and socio-economic field of the agro-industrial, forest and fishing sectors. In recent years the institute's activity has expanded into support activities to the Public Administration for the implementation of agricultural policies, in the first place those deriving from the European Union.

Recent areas of activity has seen the institute also engaged in rural development and on themes relating to the improvement of environmental resources and the management of water resources.

Furthermore, for some years INEA has been involved in the subject of desertification. A new line of research has started specifically aimed at the study of the relations between agriculture and desertification risk. In this sphere INEA can make use of the considerable mass of information obtained from the cognitive survey on the state of water resources for irrigation use in the regions of Objective 1. The institute is involved in the process of drawing up policies to combat desertification in as much as member of the technical-scientific Commission which performs support activities to the National Committee for Combating Drought and Desertification.

## **REGIONAL LEVEL:**

### **1. Basin Authorities**

These were introduced in 1989 following the coming into effect of the Law 183 on soil defence. There are 44 such authorities divided into three levels: national (Po, Adige, Upper Adriatic, Arno, Tiber and Liri-Garigliano-Volturno), interregional and regional, where the Regions concerned coordinate the actions of soil defence jointly between themselves.

The Authority is a mixed organism, made up by State and Regions, that operates on hydrographic basins considered as a single system. It was established to permit interventions of integrated planning on basin scale.

### **2. Land Reclamation Consortia**

These are responsible for implementing and managing the networks for the hydraulic reclamation of the territory and the networks primarily aimed at irrigation; furthermore they have the power to manage the plants for the utilization of treated wastewater. In Southern Italy they have operated for the territorial availability in regard to road networks, rural water supplies, electrification and urban settlements.

They are, as a rule, holders of the water derivation concession and, following the requests of the users and the needs deriving from different crops, coordinate the water use.

The Consortia, present in all the Italian Regions, total 156:

64 in the North, 29 in the Centre, 34 in the South and 19 in the Islands.

### **3. ARPA**

The operation of APAT at peripheral level is assured by regional agencies (ARPAs), set up autonomously by the single Regions and by the two autonomous provinces (APPAs); for information on the qualitative state of water bodies, it resorts to the SINA network (National Information System on Environmental Monitoring) made up of about 400 qualitative monitoring stations located on the national territory and 8000 monitoring stations on the water cycle (hydro-meteo-pluvio parameters).

## **3. DATA AND INFORMATION SYSTEM**

### **THE INSTITUTIONS THAT COLLECT, RECORD AND PROCESS DATA THAT PROVIDE A REPRESENTATION OF NATURAL PROCESSES AND SOCIO-ECONOMIC PATTERNS DIRECTLY OR INDIRECTLY RELATED TO DROUGHTS**

## **NATIONAL LEVEL:**

1. **Central Office of Agricultural Ecology**, (within the Agricultural Policies Ministry), one of the oldest institutions with about one hundred meteorological stations
2. **Meteorological Service of the Italian Air Force**, including networks of gauges oriented mainly to air navigation and meteorological forecasting.

3. **Hydrographic Service**, established in 1917 and reformed in 1989 as Hydrographic and mareographic Service, including 14 hydrographical districts defined on basin basis, today transferred into Regional Agencies for Environmental Protection (ARPA), while the central office has been inserted into Agency for Environmental Protection and Technical Services (APAT). Collected data include maximum and minimum daily temperature, daily precipitation total and annual maxima for short durations (from 1 hour to 5 days) published in Part 1 of Yearly Reports and average daily hydrometric levels, discharges measured in hydrographic gauges on main rivers, periodic levels of groundwater and sediment transport on rivers published in part 2 of Yearly Reports.
4. Geographic and cartographic information presents very high standards, due to the long activity of the **IGM** (Military Geographic Institute) at national level and to the several regional initiatives for developing technical maps at small scale (1:2000; 1:5000). Digital Cartography at different scales is now available for almost the entire national territory
5. Demographic information is periodically updated by **ISTAT** (Italian Statistic Institut) through a national census generally with 10 years intervals which include data acquisition on economic activities such as agriculture and industry.

#### **REGIONAL LEVEL:**

1. Several **Meteorological and Agro-meteorologic Services** in most of Italian Regions oriented to collect and disseminate meteorological data, particularly those of interest for agricultural activities.
2. Water quality data regarding both surface and groundwater resources are collected by **ARPAs**, under the coordination of APAT connected to the Ministry of Environment. However a few ARPAs are up to now fully operative due to the delays of the regional administration in implementing them.

#### **LOCAL LEVEL:**

1. Periodic surveys on irrigated districts are carried out by **INEA** (National Institute of Agricultural Economy) and by **ANBI** (Association of Land Reclamation Consortia), particularly during recent drought events. Also annual values of energy produced by hydroelectric power stations are published by **ENEL** (Electric Power Agency). Data on municipal water consumption is available for **FEDERGASACQUA**, an association of water utilities.

#### **4. PLANS AND ACTIONS IN DROUGHT MANAGEMENT**

##### **MITIGATION ACTIONS**

Use of non-conventional resources

##### **Reuse of Wastewater**

Sardinia Region.

- Within the sphere of the INTERREG IIC community project the complete implementation was foreseen of the intervention named "Connection of the urban wastewater treatment plant of the Cagliari area and neighbouring municipalities (Arenas Is) to the Simbirizzi basin".

The implementation of the intervention has ended the pouring into the sea, although purified, of the wastewater from Cagliari and neighbouring municipalities. The wastewater is now totally used for irrigation purposes. The idea of implementing the intervention was backed by a study of non conventional techniques for the treatment of wastewater through pilot plants, within the sphere of a convention between the Ente Autonomo del Flumendosa, activator of the intervention, and the Institute of the Environment of the joint centre of Research ISPRA.



- With financing of the European Community within the sphere of the Envireg programme for the protection of the environment in the sub-programme Propenv 1 and with a co-financing of the Council for the final arrangement of the distribution network and the activation of the service, the Villasimius (CA) council implemented a project of a system of reuse of treated water. The overall system is made up of a biological treatment plant a activated sludges with final disinfection and discharge into the Foxi river (prior to the reuse project) and a refinement plant made up of: pumping section, pressure filter, ozonization, final disinfection with PAA or sodium hypochlorite.

The works, commenced in 1995 and completed in 1999, have permitted the implementation of a treatment plant capable of regenerating 6.000 cu. m. of purified water a day and a distribution network capable of serving 250 hectares of agricultural land and about 150 hectares in tourist areas.

The reuse system came into operation in the summer of 1999 and distributed, in two months, 40,000 cu. m. of treated water for the watering of the green areas of two hotel infrastructures. In 2000, following the comforting results obtained in the experimental stage, distribution began on all the areas served by the network, creating significant interest on the part of users.

### **Desalination**

Desalination has been used in Italy in cases proved to be economically more advantageous respect to traditional water supply. About ten plants have been implemented, in some areas of the south and on small islands, which jointly develop a water capacity of about 160 thousand cu. m./day.

## **PLANNING METHODOLOGIES**

### **The Italian Committee to Combat Drought and Desertification**

The ICCD (Italian Committee to combat Drought and Desertification) approved on 22nd July 1999 the “Guidelines for the National Action Programme” which include a preliminary map of Italian areas affected by desertification, in order to identify the most affected areas and the most appropriate responses to be given by the local authorities.

Many initiatives were promoted at the local involving of society and obtaining the full support of local governments. These initiatives were to identify vulnerable areas and formulate related protective actions.

In December 1999, the ICCD (Italian Committee to combat Drought and Desertification) prepared the National Action Programme to combat drought and desertification in Italy; through Resolution n°229/99 the NAP was approved by the Interministerial Committee for the Economic Planning (CIPE).

The Italian National Action Programme was completed and approved on 22 December 1999.

A “Preliminary national map of Italian areas prone to desertification” is already available, and was produced by a working group co-ordinated by the Italian Hydrographic and Tidal Service (IHOS) on behalf of the Italian Committee to Combat Desertification (CNLD). The map was elaborated with data provided by the Geographic Information System (GIS), combining four different indices that reflect specific processes related to desertification. These indices include the following:

- aridity index, defined as the relationship between the average yearly precipitation and the average yearly potential evapotranspiration;
- soil characteristics index, related to the pedoclimatic classification the Italian territory (dependent on soil and its biotic cover);
- land use index, obtained by means of a reclassification of the original Corine Land Cover classes;
- demographic variation index, defined as the percentage of population variation between 1981 and 1991, on a municipal scale.

A final index of sensitivity to desertification was elaborated on the basis of the four indices listed above. The index of sensitivity to desertification, displayed in map format, shows the spatial distribution of the phenomenon throughout the Italian territory.

The results obtained represent a first attempt to identify Italian areas prone to desertification, or Desertification Sensitive Areas (DSA). Further indices are being processed, taking into consideration other factors that affect the state and trends of the complex environmental processes associated with desertification (i.e. drought, soil erosion, slope aspect. etc.).

The drought monitoring services.

#### **APAT Drought Bulletin.**

APAT, in the sphere of the INTERREG IIC Community Programme - Territorial Planning and coping with the effects of drought, thanks to the scientific contribution of various universities, has already for some time kept watch on the state of drought on the national territory by means of a monthly drought bulletin published on its web site. The analysis of the climatic conditions in Italy is available from the first days of every month and can be freely consulted.

The bulletin is aimed at providing information of diagnostic character on the state of drought in the entire country. The state of drought is documented by some significant indices, among which the Standard Precipitation Index and the Palmer Drought Severity Index.

The choice of the indices to be inserted is based on various considerations. The state of drought of a particular region depends on a considerable number of elementary data on the state of many environmental parameters. Consequently it is of great use to develop some indices which are capable of summarizing the general picture of the climatic situation. An index is therefore a single number, whose usefulness is decidedly more than the information of which it is synthesis.

This notion acquires an even greater meaning whenever a drought analysis is distributed in the form of a service. In such case, the necessity of also reaching a public not necessarily specialized, makes the use of indices which are easily comprehensible indispensable.

Another important characteristic of an index is its ability to describe the phenomenon on different time scales, so that the types of drought previously listed are correctly diagnosed.

Various drought indices have been developed and applied in international publications. The SPI is among one of the most used indices by international drought monitoring centres, therefore its effectiveness in capturing the nature of the phenomenon has been tested on many climatic realities.

The bulletin that has been developed is a prototype product still under review and expansion.

In particular, the analyses of the drought phenomena on large scale are currently available utilizing the data of the NCEP/NCAR re-analysis, while the analyses on regional scale utilizing the recorded pluviometric data fall within the objectives of a future extension of the bulletin.

#### **Observatory for Meteorological Adversities.**

The Observatory for Meteorological Adversities of the Central Office of Agricultural Ecology (UCEA) proposes to identify and describe meteorological conditions which, departing significantly from the norm, could have repercussions on the production or on the agricultural activity in a broad sense. With this objective a bulletin is issued every ten days on drought and meteorological anomalies in collaboration with the CONSORZIO ITA and with FINSIEL.

Drought defined as that natural disaster which damages agricultural production through a reduced natural water availability and considering that the phenomenon involves a large number of climatic and environmental variables, in this perspective it is too complex to be completely described by only pluviometric deficit. In particular for this bulletin the water state of the soil was chosen to be used as the variable appropriate to providing the best indicator of the disaster and to be therefore translated into quantitative monitoring indices of the phenomenon in each of the "AGROMET" cells (regular grid with sides of 8 Km which covers the entire national territory).

The soil water content (AW = Available Water) is calculated through the sub-model of water balance included in the agrometeorological model SAM. Such water balance is calculated daily and for the entire



historical series available (more than 20 years) commencing from meteorological data of the Air Force and of the National Agrometeorological Network and from pedoclimatic data available from the Italian map of AWC (Available Water Capacity). The ratio between the current soil water content and the normal water content (where the latter is calculated as average historic series in the same territorial unit relative to the same decade) it is at this point used as drought indicator in each cell of the grid. Where such ratio is less than 1 (one) there is in fact sign of a water shortage respect to the norm. The reference period, both for the current and historical values, is the decade. Such calculation is translated into a cartographic layer: Extent of the drought (map n°1), Duration of the drought (map n°2 and map n°3), Soil water content (map n°4), Percentage soil water content (map n°5).

## ANNEX VI - ROMANIA REPORT

### 1. LEGISLATION / PUBLIC POLICY

#### MAINS LAWS AND DECREES ISSUED ON WATER RESOURCES USE, FLOOD DEFENCE AND POLLUTION CONTROL

DATA	N.º	NAME	NOTE
1924	LAW 41/24	The first Water Low	Abrogated 1974
1953	R.D. 143/53	Rregarding the national water use and water quality protection	
1973	LAW 9/1973	Law on the environment protection	
1974	LAW 8/74	Water Low	Abrogated 1996
1979	R.D. 414/79	Decree no 414 – The limit admissible values of the main pollutant substances discharged in rivers	
1988	STAS no.4706	Surface waters. Quality categories	
1989	LAW 5/89	The Law regarding the rational water management, protection and assurance of the water quality	
1990	LAW 17/90	Republished, regarding the legal regime of interior marine water, territorial marine water, exclusive economic zone of Romania – reglements the legal status of the United Nation Convention on the Sea Right	Unc ratiified by Romania LAW 110/96
1990	G.D. 138/90	Punishments and contravention in the water field	
1990	G.D. 1001/90	Establishing a unitary system of payments for the products and services of water management	
1993	O 761/93	The setting of the SAPAD as operative system in order to prevent, warn and fight in case of accidental pollution on Danube River	
1995	LAW 124/95	Law for Natural Disaster preparedness	
1995	LAW 137/95	The Law of environment protection	Completed by Ordinances 275/97 454/ 01, 1072/2003, and 44/2004
1995	O 84/95	Establish the Accident Emergency Warning System – Pincipal International Alarm Center (AEWS-PIAC) for accidental pollution in the Danube River Basin	
1996	LAW 84/96	To ensure the water sources for agriculture and water supply for villages, fish culture basins, protection against overflow and protection of the lakes against sediments	
1996	LAW 107/96	The Water Law, establishing the river basin water management concept, both surface and groundwater; defining water licence and permit for water use and wastewater discharges	

1997	LAW 171/97	Regarding the approval of the Plan of territorial strategy Section II “Water”	
1997	G.D. 101/97	HG no. 101 – Sanitary Protection Areas	
1997	G.D.730/97	Eestablishing the admissible limit values of the pollutant discharged in the water resources	NTPA 001 was established
1997	O 645 and NTPA 002	Order of the MAPPM, MLPAT (NTPA no 002) regarding admissible limit value of the pollutant discharged in the sewage system	
1997	O.275/97	Setting up the system of special surveillance in case of non-observance the measures established to assure the conditions stipulated in the Water Management Permit	
1997	O.277/97	For approval of the norms regarding the content of the Technical Documentations necessary to obtain the Consent and Authorization for Water Management	
1997	O.278/97	Ordinance regarding accidentalk pollution – methodology and plans	
1997	O. 281/97	Regarding procedure of access to water management information	
1997	O. 276/97	Approval of methodology planning the restriction of using water in the periods short of water	
1997	O. 396/97	Dams and reservoirs exploitation regulation	

1998	Law 219/98	Concedeed water public goods and services and concession procedure	
1999	G.D.638/99	The protection against floods	
2000	G.D. 47/2000	Water charge (tariffs and penalties)	
2000	G.D. no. 964/2000	regarding the Action plan for protection against the pollution with chemicals from agriculture	
2000	O. 1212/2000	Administrative coordination in the River Basin District	
2000	G.D. 472/2000	Water quality protection measures	
2001	LAW 22/01	Transboundary basins water quality impact	Completed by Ordinance 864/2002 regarding public participation
2001	LAW 192/01	Regarding the fish fund, fishing and aquatic culture	
2001	Order no. 913 /2001	ntioanl Administration “ regarding the approval of 3 Plan for Basin Water Management	
2001	G.D. 913/01	Apele Romane” borning, having in its patrimonium all water bodies for water management	
2001	O 452/105.951/2001	regarding the approval the organization and operating rules of the Commission and of the Support Group for enforcing the Action Plan for water protection against pollution with nitrates from agriculture	

2001	O 454	Regarding the representatives sections for the intercourses as a part of the National System for Water Quality Surveillance	
2002	O. 1141/2002	To approve the procedures and competences to issue the water management notification/permits	
2002	O 1144/2002	Regarding dangerous substances -To set up the register of pollutants due to the activities specified by the Ordinance no 34/2002	
2002	O 1146/2002	To approve the regulation for the reference objectives in order to classify the quality of surface water	
2002	O 501/03	Register of pollutants	Completed by O 1440/03
2002	G.D. 202/02	The quality of the waters for fish	
2002	G.D. 201/02	The quality of the water for mollusc	
2002	G.D. 202/02	The quality of the waters for fish	
2002	G.D. 201/02	The quality of the water for mollusc	
2002	LAW 118/02	Approval of the “Action Program to reduce the pollution of the aquatic environment and groundwater, caused by dangerous substances”	
2002	O. 1146/2002	classification of the quality of surface waters	Completed by Ministerial Order no. 377/2001 regarding the approval of the norms for surface water quality
2002	O 501/03	The requires of the surface water quality used for drinking waters	
2002	G.D. 100/02	The bathing water quality	
2002	G.D. 458/02	Establishing the quality of drinking water	
2002	G.D. 459/02	The bathing water quality	
2002	G.D. 459/02	The Urban waste water treatment discharges in the aquatic medium	
2002	G.D. 188/02	Provides: <ul style="list-style-type: none"> <li>- quality norms which are to be fulfilled the surface water in order to be used as potable water – NTPA 013;</li> <li>- norms regarding the measurement methods and the frequency of testing the surface water – NTPA 014 – NTPA 014</li> <li>- Annex 1a – NTPA 013 – definition of standard treatment technology for transforming the surface water of categories A1, A2 and A3 in potable water;</li> <li>- Annex 1b – NTPA 013 characteristics of surface water used for production of potable water;</li> <li>- Annex 2a – NTPA 014 – reference methods</li> <li>- Annex 2b – NTPA 014 – minimal frequency of annual testing</li> </ul>	

2002	100/2002	Regarding the quality of the potable water	
2002	<b>Law no. 458/2002</b>	The Law regarding the water quality	Completed by O 1440/03
2002	<i>LAW 645/2002</i>	The Urban waste water treatment discharges in the aquatic medium, regarding the prevention, reducing and integrated control pollution	Abrogated by 152/99
2002	<i>G.D. 118/02</i>	Approval of the action plan to reduce the pollution of the aquatic environment and groundwater caused by dangerous substances	
2002	<i>O 341/02</i>	For prevention, reducing and integrated control of pollution	
2002	<i>G.D. 100/02</i>	The bathing water quality	
2002	<i>G.D. 459/02</i>	The bathing water quality	
2002	<i>G.D. 459/02</i>	The Urban waste water treatment discharges in the aquatic medium	
2002	<i>G.D. 188/02</i>	Provides: <ul style="list-style-type: none"> <li>- quality norms which are to be fulfilled the surface water in order to be used as potable water – NTPA 013;</li> <li>- norms regarding the measurement methods and the frequency of testing the surface water – NTPA 014 – NTPA 014</li> <li>- Annex 1a – NTPA 013 – definition of standard treatment technology for transforming the surface water of categories A1, A2 and A3 in potable water;</li> <li>- Annex 1b – NTPA 013 characteristics of surface water used for production of potable water;</li> <li>- Annex 2a – NTPA 014 – reference methods</li> <li>- Annex 2b – NTPA 014 – minimal frequency of annual testing</li> </ul>	
2002	G.D. 100/2002	Regarding the quality of the potable water	
2002	<b>Law no. 458/2002</b>	Establishing the quality of drinking water	Completed by O 1440/03

2002	<i>O. 860/2002</i>	To approve the procedure for environmental protection assessment and for the issue of the environment notification	
2002	<i>O. 864/2002</i>	To approve the procedure to evaluate the impact on environment in transboundary context and the public involvement for taking the decision	
2002	<i>G.D. 1625/2002</i>	Regarding the National Agency for Environment Protection	
2002	<i>E.O. 34/2002</i>	Emergency Ordinance (EO) regarding the prevention, reducing and integrated control pollution	
2003	<i>G.D. 1625/03</i>	Regarding the Regional Agency for Environment Protection	
2003	<i>G.D. 1626/03</i>	Regarding the Environment National Guard, as a specialized body for control	
2003	<i>G.D. 761/03</i>	Regarding National Administration Apele Romane as managing the waters in public domains	
2003	<i>LAW 404/03</i>	Regarding the approval of Monitoring, a National integrate support of surveillance, control and decision for reducing the pollution with chemicals from agriculture	Amended 107/96 LAW
2003	<i>G.D. 1626/03</i>	Regarding the Regional Agency for Environment Protection	
2003	<i>G.D. 761/03</i>	Regarding the Environment National Guard, as a specialized body for control	
2003	<i>G.D.</i>	Regarding National Administration Apele Romane as managing the waters in public domains	
2003	<i>LAW 404/03</i>	Regarding the approval of Monitoring, a National integrate support of surveillance, control and decision for reducing the pollution with chemicals from agriculture	
2003	<b>O. 1072/2003</b>	of the Ministry of Agriculture, Forest, Waters and Environment, for the approval of the methodology for water management specific activities development	Completed by Ordinance 34/2002
2003	<b>O. 1440/2003</b>	To approve the national guide to implement the register of released pollutants from activities specified by Ordinance no. 34/2002	
2003	<b>O. 1072/2003</b>	To approve the organizing of the integrated national monitoring system, control and decision making to reduce the quantities of pollutants resulted from agricultural sources	
2003	<i>G.D. 1626/03</i>	Regarding the Regional Agency for Environment Protection	
2003	<i>O 501/2003</i>	To approve the regulation for carrying out the first inventory of the pollution sources for aquatic environment and groundwater	
2003	<i>O 246/2003</i>	Regarding the prohibition of fishing	
2003	<i>O 114,115/2003</i>	Methodology establishing dam category of importance and experts surveillance program	
2004	<i>G.D.408/2004</i>	Ministry of Environment and Water Management is in charge of building water and environment strategies , regulations, management and state authority for water and environment	
2004	<i>O 44/2004</i>	To approve the regulation to carry out the monitoring of water quality/ priority for dangerous substances	
2004	G.D. no. 88/2004	for the approval of surveillance, sanitary inspection and control norms of the water from natural areas set-up for bath	

## LEGISLATIVE INNOVATIONS IN WATER AND DROUGHT MANAGEMENT

LAW N° \_\_\_\_\_ 107/96 \_\_\_\_\_

NAME \_\_\_\_\_ regulating Water Law \_\_\_\_\_

### ADVANCED ASPECTS:

The Law 107/96 on water settles two important elements:

- Water management will be provided at the basin level, activities being coordinated by the Basin Committees, which provide the participation of the involved stakeholders in the decision-making process for water management
- The economic mechanism consisted in prices, tariffs, penalties and bonus having the aim to protect the water resources and to provide an efficient management for the water systems.

LAW N° \_\_\_\_\_ 1001/90 and 47/2000 \_\_\_\_\_

NAME \_\_\_\_\_ regulating the water quality and shortness or flooding \_\_\_\_\_

### ADVANCED ASPECTS:

An integrated system of payments for products and services for water management, for preserving and protection of water against:

- pollution and over-use,
- against flooding
- for set-up water intakes with limits of discharges during droughts
- implementation of the market principles

for increasing the efficiency of water management and protection of water quality.

LAW N° \_\_\_\_\_ 171/97 \_\_\_\_\_

NAME \_ planning the land and urban development strategy in connexion with water resources (Section II Water) \_\_\_\_\_

### ADVANCED ASPECTS:

The Law 171/97 has removed the exceptions to the general principle that all surface and groundwater resources must be considered public, and has introduced important innovations asserting that water resource use must accomplish criteria of efficiency and effectiveness, also taking into account criteria of solidarity and environmental protection. The land and urban development should respect the sustainability of water resources; regarding to that principle, are illustrated the attributions of public administration in their accomplishment.

Ordinances 276 and 396/97 define the methodology of planning the restrictions of using water, for all water operators (dams included) in case of droughts.

LAW N° \_\_\_\_\_ 152/99 \_\_\_\_\_

NAME \_\_\_\_\_ regulations on the safeguard of waters from pollution \_\_\_\_\_

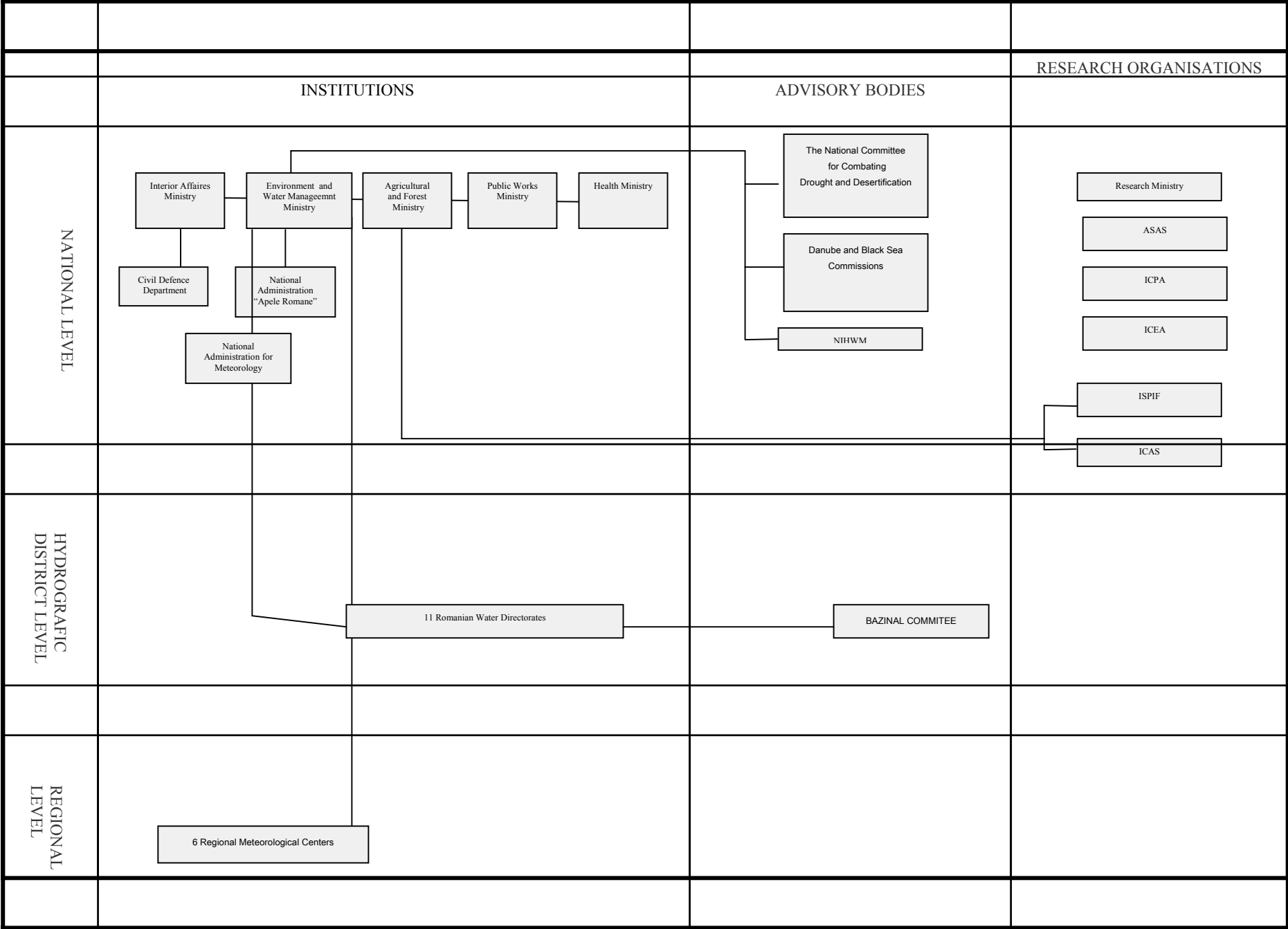
#### ADVANCED ASPECTS:

The Legislative Decree 152/99 (amended by Legislative Decree 258/2000) has been conceived in order to adopt into Italian legislation the European directives 91/271 on urban wastewater treatment and 91/676 on protection of water from agricultural pollution. It also rearranged all previous Italian legislative framework on pollution control, replacing the fundamental law n.319/86 (Merli act).

Finally, it has defined the stages for achieving environmental quality objectives, including the analysis of present conditions and classification of environmental status, the identification of restoration objectives and the implementation of the necessary actions in water bodies.



**THE MAJOR INSTITUTIONS WHICH PLAY A ROLE IN COMBATING DROUGHT**



## 2. THE MAJOR INSTITUTIONS WHICH PLAY A ROLE IN COMBATING DROUGHT

### NATIONAL LEVEL:

#### **1. Administration and Interior Affaires Ministry**

##### **1.1 National Committee for Urgent Situations**

On the base of the Water law no.107 and the Law of Urgent Situations Management, "Establishment of the National Committee for Urgent Situations", the activities and civil defence tasks, coordinated at central level by the Prime Minister's Office, in charge with:

- the study and determination of the causes of disastrous phenomena, natural or connected to human activity, the identification of risks and the evaluation of the consequent effects, the localising of the areas of the national territory which could be concerned by such events;
- the containment or elimination of the possible causes which can determine an emergency situation, among which also that of water, with the consequent involvement of people, property and environment ;
- assure the people affected by a state of emergency every form of initial assistance;
- overcoming the emergency by implementing those initiatives necessary and unable to be delayed in order to remove the obstacles to the resumption of normal living conditions.

The National Committee for Urgent Situations by the National Inspectorate for Urgent Situations jointly sets up with the Regions and local bodies, water emergency plans and gives guidance to Counties (Judet) Commission delegates for the destination of available resources: the maximum priority must be given to human and animal use, then to public use, agricultural and zootechnic use and industrial use, encouraging, nevertheless, the totality and functioning of production plants and existing levels of employment.

#### **2. Ministry of Environment and Water Management**

In the 2004 Romania re-established a Ministry of Environment and Water Management, charged with coordinating government activities for water management and pollution survey. At MEWM level is the Ministerial Commission for Dangerous Phenomena Abatement, coordinated by the Directorate for Dangerous Phenomena Prevention. Here it discharges guiding action and coordination in the management of water resources, which deals with the implementation of the regulations relating to use of water and defence against flooding, from pollution, management of integrated water service, and programming of the relative financial resources.

The same Direction is furthermore the organ which sees to the issuing of concessions for large diversions of water and coordinates the allocation of funds to the National Administration "Apele Romane" (ANAR) for water works and hydraulic maintenance. ANAR sees to the execution of the hydraulic works in the principal areas of the basins of national importance and look for a unitary development of the local hydrotechnical works developed by Local Administration or Water Operators.

The Minister for Environment and Water Management is responsible for the preparation of the Report on the state of the environment and water management, for issuing directives on rational use of water and on reuse of treated wastewater and to elaborate National Strategy for Drought Mitigation.

Under the authority of the Ministry there are:

##### **2.3 National Administration Apele Romane**

National Administration Apele Romane is responsible with water management strategy implementation. ANAR is responsible with establishing rules for water use and distribution during drought. It has 96 large dams in their property to assure water supply at the national level, but is establishing rules for water use for the Hidroelectrica reservoirs, too (reservoirs with hydroelectric

power production as main task); 360 reservoirs are important ones in Romania, with a total volume of 13.07 millions of cubic meters. The water management plans are elaborated at the basin level (there are 12 large basins in Romania, under the coordination of the 12 Water Directorate). ANAR coordinates the hydrological activity, at the national level by National Institute for Hydrology and Water Management (INHGA) and on the Romanian territory by hydrological monitoring (950 hydrological stations) and by water quality monitoring (66 automatic stations and 260 water quality first order water quality sampling). ANAR has 12 Basin Water Quality Laboratories certified ISO 14001 and 34 Water Quality Laboratories for the other counties at the Water Management Systems under the ANAR administrative coordination. ANAR is approving the water use permits for all enterprises in Romania, establishing rules for water supply during droughts (priority in water supply, minimum discharges will be supplied etc.).

The main tasks of ANAR are:

- b) monitoring of the water, hydraulic and water supply networks and technical coordination;
- c) fixing of water tariffs supplied through water mains;
- d) planning and management of national networks;
- d) planning, financing, implementation and management of the water, hydraulic and water supply networks in undeveloped areas;
- e) surveillance of the Romanian reservoir/river water balance;
- f) necessary and consequent works for the issuing of concessions for large diversions of water for different operators.

#### **2.4 The National Administration for Meteorology (ANM)**

The National Administration for Meteorology in 2004 is replacing the National Institute of Meteorology and Hydrology (INMH), and is responsible with meteorological monitoring (60 automatic stations and 200 meteorological stations), meteorological drought forecasting, as well as with researching activities regarding droughts and climate change inducing aridization phenomena at certain regional scale.

Under the supervision of the Ministry of Environment and Water Management, the National Agency for Environment operates (ANM):

#### **2.5 National Agency for Environment Protection (ANPM)**

The operation of ANM at peripheral level is assured by regional agencies (ARPE), set up autonomously by the single Regions; for information on the qualitative state of water bodies, it resorts to the SINA network (National Information System on Environmental Monitoring). It is responsible with spill prevention and with environmental permits for all enterprises in Romania.

#### **The National Committee for Drought and Desertification Assessment**

It has been introduced by 2002 ministerial decision, at the Ministry of Environment and Water Management and coordinates the implementation at national level of the United Nations Convention on combating drought and/or desertification (UNCCD).

The National Committee, elaborate the guidelines of the national action plan for combating desertification, where the sustainable management of the water resources represents one of the four important sectors of intervention, directed primarily at safeguarding water, the control of water demand, of the extraction and of outlets, the reduction of wastage and leaks, the rationalisation of irrigation activities, incentive to research into multiple uses of water, the development and reuse of wastewater in agriculture, the expansion of prevention schemes, mitigation and adaptation of the effects of drought events. It was financing a large program for drought mitigation, collaborating the

main institutes responsible in water, soil and agriculture research as ICPA, NIHGA, NAM, ISPIF, IAE etc. under the umbrella of the Agriculture and Forestry Academy “Gheorghe Sisesti”.

### **3. Agriculture, Forestry and Rural Development Ministry (AFRDM)**

The AFRDM is responsible with agriculture and rural development strategy to face problems during droughty periods. It has jurisdiction of general control and national coordination regarding large infrastructure networks of irrigation declared of national importance, coordinating ISPIF activity.

Ministry of Agricultural and Forest Policies is responsible for sustainable agriculture and within thematic working groups have been formed among which that of desertification.

### **4. Ministry of Transport, Constructions and Tourism**

Within the Ministry the transport on the Danube establish clear conditions for water ways exploitation during drought s for transport purpose.

The High Council of Public Works as “highest technical-advisory organ of the State on the subject of public works” is currently divided into six sections. In particular the 2nd and 4th Sections regard respectively: Hydrogeology, Geotechnics, Consolidation and shifting of built up areas, transport lines and distribution of water, gas and electrical energy, use of public buildings.

### **6. Ministry of Health**

Ministry of Health is responsible for controlling water destined to human consumption.

The Ministry of Health attends to the activities of coordination and supervision and to direct intervention of State concern in regard to the health protection, environment and living conditions and to the well being of people and animals, as well as to information and communication to stakeholders and citizens and to internal and international institutional relations

Within the scope of this department the general directions have been set up among which the general direction for health protection which, apart from other functions, performs that related to hygiene-sanitary characteristics of water, providing:

- external controls, aim at ascertaining the quality of water distributed for human consumption. In the case of water supply of unsatisfactory quality, it adopts the necessary measures to safeguard public health and, in any case, to apply the due sanctions.

- internal controls which the managing authority of the water supply network (or the owner of the food company) is obliged to carry out in order to check and guarantee himself the potability of the water which is distributed to the population (or uses as ingredient in the production cycle of foods and drinks).

The water supply networks must be equipped with an internal laboratory for the analytical control of the parameters of the purification cycle.

The operation of the surveillance program on swimming water is in the responsibility of the Health Ministry, too.

## **RESEARCH ORGANISATIONS**

### **1. Ministry of Education and Research (MER)**

MER is the national research organization, with general scientific competence and financing the major scientific research programs in Romania; it carry out activities of primary interest for the promotion of science and the progress of the country. MER is a public undertaking operating in the fields of industry, energy, the environment and new technologies to support competitiveness and sustainable development.

A significant research program has been carried out in recent years for the National Defense against Hydrogeological Disasters, which exercises coordination action of research aimed at soil protection, control of extreme events of flood and low water and at the evaluation of vulnerability of groundwater.

The main lines of activity are the following:

5. Integrated research for the application of innovative technologies and processes for combating desertification;
6. Application of the UNO (United Nations Organization) Convention on "combating drought and desertification";
7. Research aimed at supporting the Regions in intervention projects under the WMO recommendation.

## **2.1. Institute of Danube Delta Research**

In the field of research in the sector of Danube Delta the Romanian Institute of Danube Delta Research with its office at Tulcea holds a position of international prestige. The main role is studying the wide life in the Danube Delta, water balance and land development for biotope protection and reserve protection. Low water in this ecosystem was studied and different solutions were provided for diversity protection.

## **2.2. Institute of Soil Research (ICPA)**

The research activity has as main objectives:

- Assessing sustainable use of soil and land resources;
- Sustainable land use planning and technological recommendation;
- Evaluation of the quality of the soil resources and elaboration of measures for their protection, conservation and amelioration;
- Pollution of soil - in relation to air, freshwater and groundwater pollution - and the consequences on human health;
- Pedological characterization aiming at agricultural land use restructuring and resource conservation at different levels (village, county and nation-wide scale);
- Land evaluation in the context of private agriculture and market economy; Information for land reform;

## REGIONAL LEVEL:

### **1. Water Basin Authorities (Directorates)**

These were introduced in 1989 following the coming into effect of the Law 107 on water management. There are 11 such authorities: Somes-Tisa, Crisuri, Mures, Timis-Bega, Jiu, Olt, Arges-Vedea, Ialomita, Siret, Prut, Dobrodjea. The Authority operates on hydrographic basins considered as a single system. It was established to permit interventions of integrated planning on basin scale.

### 3. DATA AND INFORMATION SYSTEM

#### THE INSTITUTIONS THAT COLLECT, RECORD AND PROCESS DATA THAT PROVIDE A REPRESENTATION OF NATURAL PROCESSES AND SOCIO-ECONOMIC PATTERNS DIRECTLY OR INDIRECTLY RELATED TO DROUGHTS

##### NATIONAL LEVEL:

6. **ANM** (within the Ministry of Environment and Water Management), one of the oldest institutions with about 260 meteorological stations
7. **Meteorological Service of the Romanian Air Force**, including networks of gauges oriented mainly to air navigation and meteorological forecasting.
8. **ANAR with Water Authorities/Directorates**, established in 1989 and reformed in 2004, including 11 hydrographical districts defined on basin basis, collected data include two daily observation of air and water temperatures, precipitation and hydrometric levels, discharges measured in hydrographic gauges on main rivers, periodic levels of groundwater and sediment transport on rivers; data are published in the Hydrological Yearly Reports. National Institute of Hydrology and Water Management validate the data and is responsible with the Hydrological Year Book elaboration.
9. Geographic and cartographic information presents very high standards, due to the long activity of the **IGFCOT** (Military Geographic and Cartographic Institute) at national level and to the several regional initiatives for developing technical maps at small scale (1:2000; 1:5000). Digital Cartography at different scales is now partially available for Romania.
10. **Romanian Statistical Institute** periodically updates demographic information through a national census generally with 10 years intervals, which include data acquisition on economic activities such as agriculture and industry. The last data updating was provided in 2002.
11. **ICPA** periodically provide sampling analysis of soil properties, upgrading cartographic products.

##### REGIONAL LEVEL:

3. Seven **Meteorological Centers** in Romanian Regions oriented to collect and disseminate meteorological data, particularly those of interest for local industry and agricultural activities.
4. Air and Water quality data regarding both surface and groundwater resources are collected by **Regional Environment Agency**, under the coordination of ICIM connected to the Ministry of Environment and Water Management.

##### LOCAL LEVEL:

1. Periodic surveys on irrigated districts are carried out by **ICPA** (National Research Institute Soil and Agriculture) and by **ISPIF** (National Institute for Irrigation and Land Reclamation), particularly during drought events. Also annual values of energy produced by hydroelectric power stations are published by Hidroelectrica (Electric Power Agency). Data on municipal water consumption is available for local operators and **ARA**, an association of water utilities, as well as from SGA (Water Management Systems of ANAR).

#### 4. PLANS AND ACTIONS IN DROUGHT MANAGEMENT

##### MITIGATION ACTIONS

Use of non-conventional resources like **Reuse of Wastewater** was tested at small scale for irrigation.

##### PLANNING METHODOLOGIES

###### The Romanian Committee for Drought and Desertification Assessment

“Guidelines for the National Action Programme” which include a preliminary map of Romania affected by aridization, in order to identify the most affected areas and the most appropriate responses to be given by the local authorities was provided by the Research Program for Drought effects prevention, coordinated by Academy of Agriculture and Forest Sciences.

Many initiatives were promoted at the MEWM involving research institutes, ANM and INHGA for drought and low flows regionalization. These initiatives were to identify vulnerable areas and formulate related protective actions.

Regionalizations were provided, combining different indices that reflect specific processes related to desertification. These indices include the following:

- aridity index, defined as the relationship between the average yearly precipitation and the average yearly potential evapotranspiration;
- soil characteristics index, related to the pedoclimatic classification the Romanian territory (dependent on soil and its biotic cover);
- land use index, obtained by means of a reclassification of the original Corine Land Cover classes;
- mean monthly low flow specific discharge
- demographic index, defined as population in the basin on a municipal scale (2002 data).

A final index of sensitivity to drought was elaborated on the basis of the four indices listed above. The index of sensitivity to desertification, displayed in map format, shows the spatial distribution of the phenomenon throughout the Romanian territory.

###### The drought monitoring services.

###### **INHGA Drought Bulletin.**

INHGA provide drought forecasts, forecasting monthly low flows and seasonal low flows.

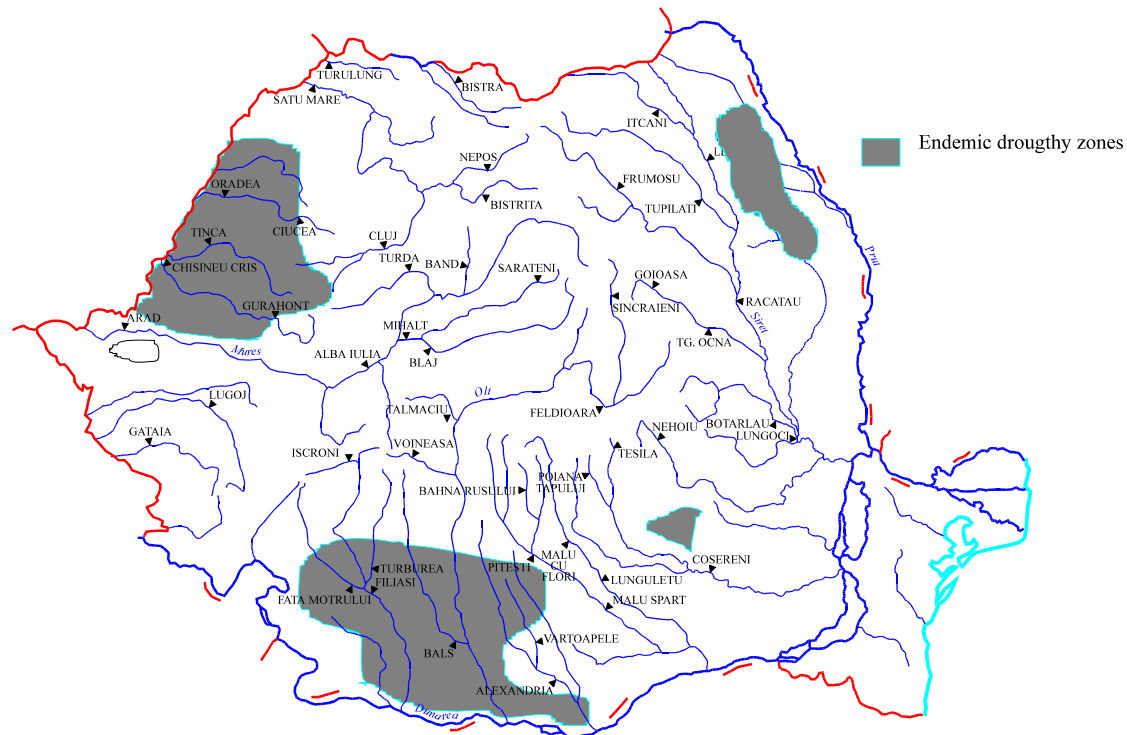
The analysis of the climatic conditions in Romania is available from the first days of every month and can be freely consulted by ANM forecasting bulletins. The state of drought is documented by some significant indices, among which the Standard Precipitation Index and the Palmer Drought Severity Index. The bulletin is aimed at providing information of diagnostic character on the state of drought in the entire country. In particular for this meteorological bulletin the water state of the soil was chosen to be used as the variable appropriate to providing the best indicator of the disaster and to be therefore translated into quantitative monitoring indices of the phenomenon in Romania.

The soil water content (AW = Available Water) is calculated through the sub-model of water balance included in the agro-meteorological model using the National Agro-meteorological Network of ANM and from pedo-climatic data available from ICPA. The ratio between the current soil water content and the normal water content (where the latter is calculated as average historic series in the same territorial unit relative to the same decade) it is used as agro-meteorological drought indicator.



In particular, the analyses of the drought phenomena on large scale (in a basin) are currently available utilizing the climatic and agro-meteorological data of ANM and the monthly mean discharges and seasonal mean discharge, forecasted by INHGA.

ICPA is forecasting the crop production in the season, taking into account the forecasted soil water content and available discharges for irrigation.



**Fig.1. The endemic droughted zones**

As a conclusion, from the first analysis carried out upon the drought phenomenon, the following can be noticed;

- the drought phenomenon is specific for the excessive climate area of our country and especially in the large extra-Carpathian agricultural areas;
- the presence of the meteorological, agrometeorological and hydrological droughts over long periods imposes a continuous stress upon the socio-economical development of the country;
- phenomenon with an extreme severeness and a record extent have occurred over an unusual long period during the last decade.

***Drought is a persistent phenomenon with a frequent repeatability. Knowledge of this phenomenon will bring great benefits for elaborating the political strategy of water resources and agriculture.***

## **National strategy of the domain in water resources**

The strategic objectives of the development of the agriculture in Romania are meant to ensure the alimentary safety of the population at proper standards and at a quality level corresponding to the international standards, to eradicate poverty in the rural areas, where half of the present population of Romania lives, and at the same time, to ensure the long term use of the climatic, water and soil resources.

The major objective of the strategy for the development of the policy in the water domain refers to the provision of the water resources with a proper quantitative and qualitative level for agriculture and industry as well as for the population in the urban and rural areas.

The amplification of the drought phenomenon during the last two decades has significant implications upon the social and economical potential of the country generally, but especially upon



the agricultural and water management strategy. This fact has determined the development of research and technological development projects and programmes for the study of the causes and for knowing the trends of the phenomenon in order to carry out the actions meant to reduce the negative effects upon several significant domains of the Romanian economy.

## **State of the problem from the meteorological and hydrological point of view**

Within the national programme for the prevention of the drought effects, ANM and INHGA has launched the research and development programme for the monitoring and prediction of the drought phenomenon and the correlation of the signals with the climatic trends in Romania. Within this programme, ANM and INHGA intends to reach the following targets:

- a. To adapt and complete the agrometeorological and hydrological monitoring for the development of an intensive programme of specific measurements in the endemic droughty areas in Romania and to achieve the data bank specific to the drought study and forecasting methodologies in order to survey and prevent the aridization extent and the occurrence of decertified areas through:*
- b. The analysis of the aero-synoptic situations leading to the installation of the drought phenomenon in Romania.*
- c. Complex study by mathematical modelling of the determinant factors in the occurrence of drought in Romania, including:*
- d. Study of the climatic conditions and characteristics of the meteorological, agrometeorological and hydrological drought phenomena intend to answer to the multiple problems as:*

The most interesting problem is to identify the causes at the large scale circulation inducing the variability in water resources: precipitation and discharges. The CCA analyse was the method used to identify the sinoptical condition leading to the drought phenomenon.

### **(a) Expected results from the future research in the domain**

- The reconstruction of the agrometeorological and water resources monitoring system;
- The provision of application programmes for the parametrisation of the agro-hydro-meteorological forecasting;
- The development of the capacity to ensure meteo-agro-hydro specialised assistance to the authorities and direct users - farmers;
- The improvement of the meteo-hydro-agrometeo data bank on the evolution of the drought phenomenon;
- The provision of forecastings;
- The elaboration of prediction estimations on the characteristics of a probable drought period;
- The estimation of the consequences upon the agricultural yield;
- The improvement of the dissemination of the information to the users (the creation of an information dissemination system towards the decision-makers at all levels and to the users of all categories).

### **(b) Users of the research results**

- Decision governmental bodies for the adaptation of the tactic actions to diminish the negative effects of the drought and to prevent their increasing;
- The research or service institutions with implications in preventing the drought effects at the national/regional-international level;
- Direct users (agricultural producers) by assistance for the adaptation to the drought conditions.

## ANNEX VII - SPAIN REPORT

### INDEX

#### 1. LEGISLATION / PUBLIC POLICY

##### MAINS LAWS AND DECREES ISSUED ON WATER RESOURCES USE, FLOOD DEFENCE AND POLLUTION CONTROL

DATE	N.º	NAME	NOTES
28 December 1978	87/1978	Ley de Seguros Agrarios Combinados (Agricultural Insurance Law)	
2 August 1985	29/1985	Real Decreto Legislativo (The Water Law)	
18 April 1986	781/1986	Real Decreto Legislativo (Texto refundido de las Disposiciones legales vigentes en material de Régimen Local)	
11 August 1998	1664/1998	Real Decreto (Royal Decree - Approval of the Hydrological Basins planning)	
21 April 1999	11/1999	Ley modificación de la Ley 7/1985, 2 abril, Reguladora de las Bases del Régimen Local	
13 December 1999	46/1999	Modificación de la Ley 29/1985 de aguas	
5 July 2001	10/2001	Ley de Plan Hidrológico National (The Law of the National Hydrological Plan)	
20 July 2001	1/2001	Royal Decree – Approval of the revised text of The Water Law	

##### LEGISLATIVE INNOVATIONS IN WATER AND DROUGHT MANAGEMENT

1. **LAW N.º:** 29/1985
2. **NAME:** The Water Law
3. **ADVANCED ASPECTS:**
  - f. Water-rights holders can make use of their rights insofar Basin Authorities approve them and issue concrete management plans detailing all possible uses for the current hydrological year (Articles 55 and 58);
  - g. For planning purposes, users or right holders are ordered according to priority explicitly established in each Basin Hydrological Plan (Article 60). In case of non defined order of priorities, the priorities are:
    - i. Urban
    - ii. Irrigation
    - iii. Industry for power generation
    - iv. other industries
    - v. Aquaculture
    - vi. Recreation
    - vii. Navigation
    - viii. Others

According with Spanish Water Act, the environmental requirements have priority over water demands, except human consumption. This requirements must be established for each body water or aquifer (Article 59.7 of the revised text of Water Act -RDL 1/2001).

1. Works and projects needed to solve emergent scarcity problems are considered works that promote the general interest (Article 46), and as such their approval procedures and financing enjoy preferential treatment;
2. Water use plan and reservoir release decisions are taken by the Basin Authorities, as proposed by the Reservoir Release Commission and Management Boards (Article 32 and 33);
3. Right-holders are allowed to freely exchange their water use rights, but the transfer requires approval of the Basin Authority and is subject to various regulatory provisions (Articles 67-70);
4. Basin Authorities can create Water Exchanging Centres, through which right holders can offer or demand use rights in periods of droughts or severe water scarcity situations (Article 71).

1. **LAW N.º: 10/2001**

2. **NAME:** The Law of the National Hydrological Plan

3. **ADVANCED ASPECTS:** (Article 27)

- The Environment Ministry will establish a system of hydrological indicators to support formal declaration of alert situation on droughts by Basin Authorities;
- Basin Authorities should develop special action plans for alert situation and droughts, including the management rules and the programme of measures to be applied on the water public domain under these situations;
- All public administrations that are responsible of supplying urban water services to cities with more than 20,000 inhabitants must develop an Emergency Plan. This Plan must be approved by the relevant Basin Authority and take into account the special action plans mentioned in the previous point.

## 2. INSTITUTIONS INVOLVED

### **THE MAJOR INSTITUTIONS WHICH PLAY A ROLE IN COMBATING DROUGHT**

#### 1. **NATIONAL LEVEL:**

##### **The Ministry of the Environment.**

It is responsible for the water resources management, through the river basin authorities, excepting those basins which wholly span inside an Autonomous Community or Region. One of the key facts regarding policy development and implementation is that most of the competencies on the protection of the environment have been allocated to the Autonomous Communities, which means that their institutions have full responsibilities for management and compliance with current policies and standards, and even legislative capacity. Thus most of the national plans or strategies currently undertaken by the Ministry of the Environment and concerning issues related the water resources require a strong co-operation with the Autonomous Communities.

The Secretariat for Territory and Biodiversity is directly responsible for water management, through the Directorate of Water, so it have competences for drought issues.

**The Directorate of Water:** it is responsible for the co-ordination of the control, monitoring and protection of water resources and wastewater between the River Basin Authorities. It must review

the Basin Plans, develop the National Hydrological Plan, and make a follow-up of all its measures. It is responsible for the development and conservation of the new or existing hydraulic infrastructure and for the implementation of the European Directives concerning water quality and the WFD and the co-ordination of its requirements with the River Basin Authorities.

#### **The National Water Council.**

It was created by the Water Act 29/1985 as the highest-level consultative institution in the matter of water resources. It involves the Central, Autonomous and local governments, and all the representatives of most interested stakeholders, which gives this institution a main role for public participation. The Council is responsible for informing about the planning processes related to agriculture, urban development, industry or energy that substantially may affect the water resources and uses. The Council also must inform about the Basins and National Hydrological Plans, as well as it may make proposals to the central and Autonomous institutions on new projects related to the development, protection and economy of water.

### **2. REGIONAL LEVEL:**

#### **The River Basin Authorities.**

It have long tradition in the institutional configuration of water resources in Spain, as they were firstly established by Decree in March 1926, with the aim to incorporate in the water management issues not only the Central Administration, but also the interested people from the most relevant economic sectors. At present, they have responsibilities over those river basins that span across two or more Autonomous Communities and depend on the Ministry of the Environment though they have their own statutes and budgets. Their responsibilities and organisation are established by the Water Act 29/1985.

The Basin Authorities are responsible for: the conservation of water resources and wetlands, the development of their respective Basin Plans, the technical and economic control of the permits and rights on water uses, the monitoring of water quantity and quality, the development of all measures related to demand management and efficient use of water, and the development and conservation of all works for water supply and treatment for which they have competencies.

It can sign conventions with the Autonomous or Local Governments and stakeholders in order to better fulfil their commitments. Both Autonomous and river basin authorities need a strong co-operation as the rights on some permits may affect the competencies of the former, being in that case necessary the latter to be informed. On the contrary, all decisions undertaken by the Local or Regional governments may affect the matters of the River Authorities, which inform on that respect to the former's decisions.

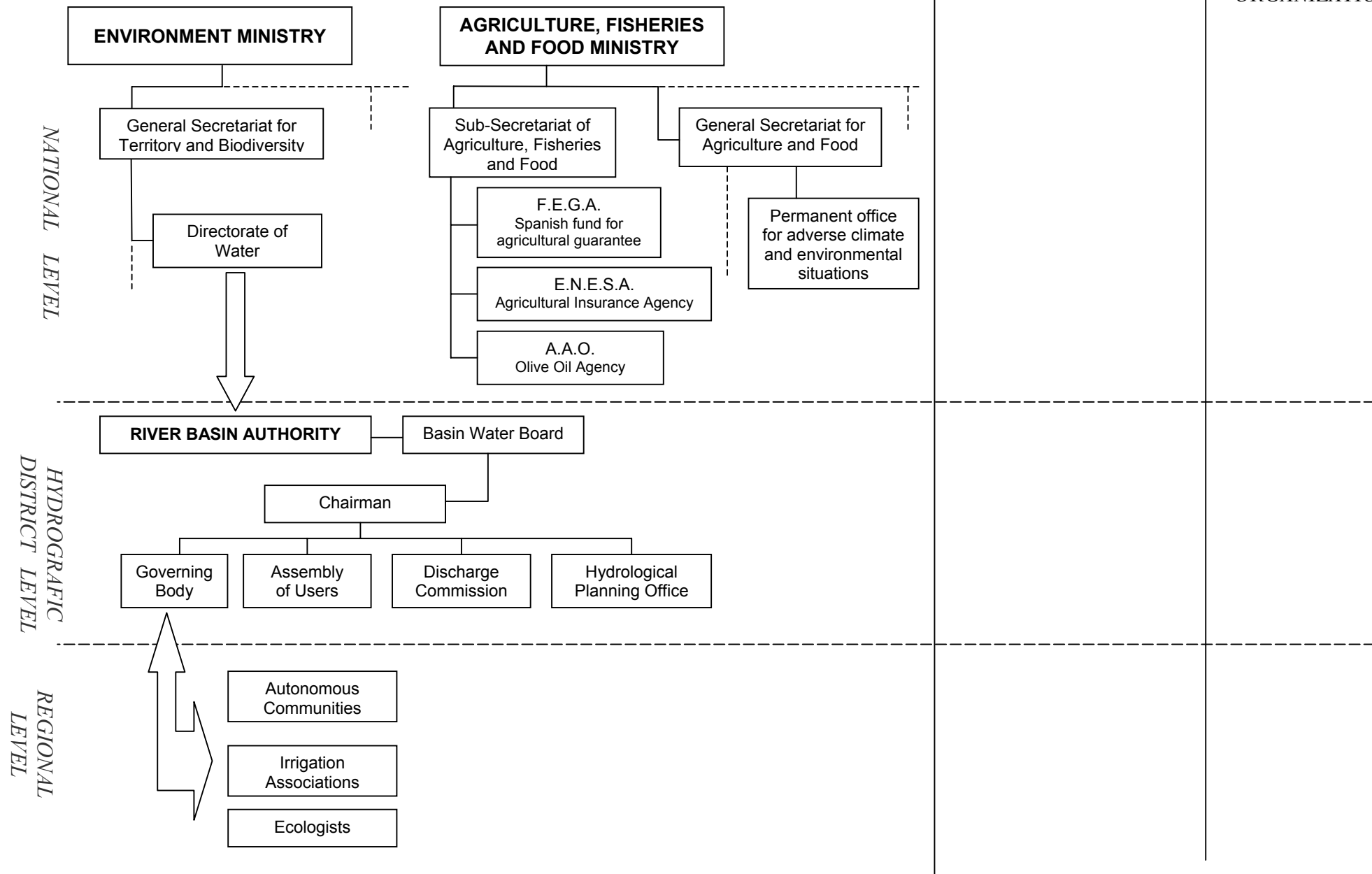
The Reservoir Committee draw up and discuss proposal to be submitted to the Basin Authority Chairman with regard filling and emptying reservoirs and aquifers, according the rights of the different users and the current hydrological situation.

### **3. OTHER INSTITUTIONS:**

*INSTITUTIONS*

*ADVISORY BODIES*

*RESEARCH ORGANIZATIONS*



### 3. DATA AND INFORMATION SYSTEM

#### **THE INSTITUTIONS THAT COLLECT, RECORD AND PROCESS DATA THAT PROVIDE A REPRESENTATION OF NATURAL PROCESSES AND SOCIO-ECONOMIC PATTERNS DIRECTLY OR INDIRECTLY RELATED TO DROUGHTS**

##### 1. NATIONAL LEVEL:

INSTITUTION	Category of data	Data
MINISTRY OF THE ENVIRONMENT	Water	Surface water, groundwater Water quality Water use (supply and demand) and allowances
	Land	Land use/cover, topography, land census, administrative units
NATIONL INSITUTE OF METEOROLOGY	Climate	Meteorological stations
NATIONAL INSTITUTE OF GEOGRAPHY	Land	Land use/cover, topography, land census, administrative units
NATIONAL INSTITUTE OF STATISTICS	Agriculture	Agricultural census, statistics (area, type of farms, labour, production, prices)
	Socio-economic Industry and energy	Macroeconomic indicators, population Statistics by activity, energy consumes
MINISTRY OF AGRICULTURE, FISHERIES AND FOOD	Land	Land use/cover, topography, land census, administrative units
	Agriculture	Agricultural census, statistics (area, type of farms, labour, production, prices)
	Forestry	Forestry (areas, products, prices)
MINISTRY OF TAXES	Land	Land use/cover, topography, land census, administrative units

##### 2. REGIONAL LEVEL:

INSTITUTION	Category of data	Data
CONFEDERACIONES HIDROGRÁFICAS (WATER BASIN AUTHORITIES)	Water	Surface water, groundwater Water quality Water use (supply and demand) and allowances
	Climate	Meteorological stations
INTERNAL RIVER BASIN AUTHORITIES (basin fully into the territory of a unique autonomous community)	Hydrology	Flow-gage,reservoirs,water quality,groundwater

##### 3. OTHER INSTITUTIONS:

INSTITUTION	Category of data	Data
COMUNIDADES DE USUARIOS (USERS GROUPS) called comunidades de regantes in case of irrigators	Water	Surface water, groundwater Water quality Water use (supply and demand) and allowances

## 4. PLANS AND ACTIONS IN DROUGHT MANAGEMENT

### MITIGATION ACTIONS PLANNING METHODOLOGIES

#### **Normative references:**

Law 10/2001 Plan Hidrológico Nacional, Section 27 “Droughts management” and different Sections of current Water Act (Texto Refundido Real Decreto-Legislativo 1/2001).

#### **DROUGHT PERIODS**

Process:

- The Ministry of Environment establish a Hydrological Indicators System (HIS)
- The River Basin Authority (Confederación Hidrográfica) prepare a Special Plan submitting it to the River Basin Council and the Environment Ministry for approval. This Special Plan includes water supply (more than 20.000 inhabitants) directives in case of drought or drought warning.  
River Basin Authority declares state of drought or drought warning, according HIS threshold, initiating the measures included in the Special Plan.
- The institutions responsible for water supply (more than 20.000 inhabitants) have to draw up a *Drought Emergency Plan* and implement it when the state of drought or warning has been declared by the River Basin Authority.

#### **Forecast:**

The hydrological situation is monthly monitored by the Environment Ministry. If the respective warning threshold are exceeded, the River Basin Authority declare the state of drought or drought warning.

#### **Drought management:**

- *Special Basin Plan*  
The River Basin Authority declares the state of Drought and zones affected. The Special Plan (controlled by the River Authority) and Drought Plan (by the water supply institution) are initiated. Several measures must be taken with respect to:
  - o Public awareness
  - o Alternative sources
  - o Changes in management system (priority demands, ecological flows...)
  - o Water cuts
- *Exceptional case* (Water Act - Section 58)  
In circumstances of unusual drought, the Government may adopt exceptional measures in order to address the situation, even if concessions (rights of water use under certain conditions) have been granted. Such measures may include the building of emergency infrastructure.

Furthermore, the Government may authorised the River Basin Authority to set up Water Interchange Centres (*Water Bank*) to enable user rights to be waved by voluntary agreement (Water Act Section 71).

## **PERMANENT OVER ABSTRACTION**

#### **Groundwater over-abstraction**

River Basin Authority may declare (Water Act Section 56) underground water resources in a particular area to be over-exploited or at risk of being over-exploited, establishing a Withdrawal Plan in order to achieve a sustainable use of resources. This Plan could be accompanied by a complementary economic compensation plan.

## **Topics**

Implementation require be considerate by regulations and hydrological plans, with respect to:

### Strategies and policies

- Integrated water management
- Adequate economic development policies
- Water conservation and demand management
- Combined surface and groundwater use

### Technical measures

- Increase of efficiency: storage, transport and distribution
- Modern irrigation procedures (mini-sprinklers, droplets...)
- Reuse: treated urban and industrial wastewater
- Increasing storage ability
- Desalinisation

### Economical tools

- Aids for increase the efficiency using water and improving quality
- Satisfactory pricing
- Measurement of water used and quality

### Social aspects

- Improving public awareness
- Participation by users in water management institutions



# ANNEX VIII - UNITED KINGDOM REPORT

## INDEX

### 1. LEGISLATION / PUBLIC POLICY

#### MAINS LAWS AND DECREES ISSUED ON WATER RESOURCES USE, FLOOD DEFENCE AND POLLUTION CONTROL

##### England and Wales

DATE	N.º	NAME	NOTE
1991		Water Industry Act Water Resources Act	
1996	S12971 SI 888	Control of Pollution (Applications, Appeals & Registers) Regulations Protection of Water Against Agricultural Nitrate Pollution (England and Wales) Regulations	
1998	S12746	Groundwater Regulations 1998	
1999	SI 1006	Water Industry Act Anti-Pollution Works Regulations	
2000	SI 3184	Water Supply (Water Quality) Regulations	
2001	SI 3911 SI 2885	Water Supply (Water Quality) Regulations Water Supply (Water Quality) (Amendment) Regulations	
2002	SI 226	Protection of Water Against Agricultural Nitrate Pollution (Amendment) (Wales) Regulations	
2003	SI 164	Water Act Water Resources (Environmental Impact Assessment) (England and Wales) Regulations	

##### Northern Ireland

DATE	N.º	NAME	NOTE
		<i>Primary legislation</i>	
		Food and Environment Protection Act	
1973 (including amendments up to 2002)		Water and Sewerage Services (NI) Order	
1978 (including amendments up to 2002)	SR 1049 (NI 19)	Pollution Control and Local Government (NI) Order	
1993 (including amendments up to 2002)	SR 3165	Water and Sewerage Services (Amendment) (Northern Ireland) Order	
1997 (including amendments up to 2002)	SI 2777	Industrial Pollution Control (NI) Order	
	SI 2778	Waste and Contaminated Land (NI) Order	

	(NI 19)		
1999 (including amendments up to 2002)	SI 662	Water (NI) Order	
		<b><i>Secondary Legislation</i></b>	
1994		Notification of Cooling Towers and Evaporative Condensers Regulations (Northern Ireland) Prevention of Pollution (Erne System) Regulations (NI)	(not available online)
1996	SR 217	Protection of Water Against Agricultural Nitrate Pollution Regulations (NI)	
1997	SR 256	Protection of Water against Agricultural Nitrate Pollution (Amendment) Regulations (NI)	
1998	SI 401	Groundwater Regulations (NI)	
1999	SI 156 SR 3	Action Programme for Nitrate Vulnerable Zones Regulations (NI) Protection of Water against Agricultural Nitrate Pollution (Amendment) Regulations (NI)	
2003	SR 7 SR 319 SR 259	Anti-Pollution Works Regulations (NI) Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) Regulations (NI) Protection of Water Against Agricultural Nitrate Pollution Regulations (NI)	
2004	SR 419	Protection of Water Against Agricultural Nitrate Pollution (NI) Regulations	

#### Scotland

DATE	N.º	NAME	NOTE
1968		Sewerage (Scotland) Act	
1974		Control of Pollution Act	
1980		Water (Scotland) Act	
1991		Natural Heritage (Scotland) Act	
1993	SI 1155	Control of Pollution (Registers) (Scotland) Regulations	
1994	SI 2842	Urban Waste Water Treatment (Scotland) Regulations	
1998	SI 2746	Groundwater Regulations	
1999		Water Industry Act	
2001	SSI 206 SSI 175	Salmon Conservation (Scotland) Act Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) (Scotland) Regulations Water (Prevention of Pollution) (Code of Practice) (Scotland) Amendment Order	
2002	SSI 418	Water Industry (Scotland) Act Conservation of Salmon (Prohibition of Sale) (Scotland) Regulations	
2003		Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act Water Environment and Water Services (Scotland) Act	

	SSI 168	Anti-Pollution Works (Scotland) Regulations	
	SSI 273	Urban Waste Water Treatment (Scotland) Amendment Regulations	
	SSI 610	Water Environment & Water Services (Scotland) Act (Designation of Scotland River Basin District) Order	

## LEGISLATIVE INNOVATIONS IN WATER AND DROUGHT MANAGEMENT

1. **LAW N.º:** England & Wales Regulations SI 164 on 1 April 2003
2. **NAME:** EC Directive (85/337/EEC) of 27 June 1985; amended in 1997 to EC Directive (97/11/EC) and brought into legal effect through Water Resources (Environmental Impact Assessment) England & Wales Regulations
3. **ADVANCED ASPECTS:**
  - Expands protection to all surface and ground waters
  - All waters must meet “good status” by 2015
  - Management by river basin
  - Stakeholder involvement
  - Water pricing by all users
  - The polluter pays
  - Promotes integrated catchment management

## 2. INSTITUTIONS INVOLVED

### THE MAJOR INSTITUTIONS WHICH PLAY A ROLE IN COMBATING DROUGHT

#### Background:

**England and Wales:** Institutional framework for water supply in England and Wales is complex. Water supply and sewerage is supplied by private water companies; all water company abstraction is controlled by licences issued by the Environment Agency. The Environment Agency is the leading public body protecting and improving the environment in England and Wales. The framework for the operation of Water Companies is provided by Acts of Parliament.

**Scotland:** The public water and sewerage infrastructure in Scotland is owned and operated by the 3 Scottish water authorities (North of Scotland Water, East of Scotland Water and West of Scotland Water). They are public corporations accountable to Scottish Ministers and through Ministers to the Scottish Parliament. The water authorities are subject to a specific body of Scottish water and sewerage legislation - water supply duties are set out in the Water (Scotland) Act 1980 (the 1980 Act). There is no overarching system of abstraction licensing in Scotland. Similar provisions are contained in respect of sewerage in the Sewerage (Scotland) Act 1968. The regulatory framework for water services in Scotland reflects the public sector nature of the services. Its elements are:

- the Water Industry Commissioner for Scotland, who covers economic and customer service regulation of the water authorities;
- the Scottish Executive, which regulates drinking water quality; and
- the Scottish Environment Protection Agency, which regulates discharges into the environment and is accountable to the Scottish Parliament.

**Northern Ireland:** In Northern Ireland, the Water Service provides all water and sewerage services. The Environment and Heritage Service Northern Ireland (EHSNI) of the Department of Environment (DOE) is the regulator responsible for implementation and compliance with environmental legislation in Northern Ireland. The Rivers Agency of the Department of Agriculture and Rural Development (DARD NI) is the main hydrometric and hydrological agency.

1. **NATIONAL LEVEL:**

- ➔ Secretary of State, Home Office; Secretary of State for Scotland; Northern Ireland Secretary
- ➔ Dept of the Environment, Food and Rural Affairs (DEFRA)
- ➔ Environment Agency (England and Wales)
- ➔ Scottish Environment Protection Agency (SEPA)
- ➔ Department of Environment, Northern Ireland
- ➔ Rivers Agency of Department of Agriculture and Rural Development (DARD NI)
- ➔ National Assembly of Wales
- ➔ Scottish Executive
- ➔ Northern Ireland Assembly

2. **REGIONAL LEVEL:**

- ➔ 24 private water companies in England and Wales – all required to have drought management plans (see mitigation actions)
- ➔ regional water authorities in Scotland
- ➔ Northern Ireland Water Service (publicly owned equivalent of water companies in England and Wales)

3. **OTHER INSTITUTIONS:**

- ➔ Centre for Ecology and Hydrology – research into drought; development of tools for drought and low flow analysis, including software packages (Low Flows2000), process studies
- ➔ Engineering Consultants
- ➔ UK Universities – drought research by Geography and Engineering Departments

3. **DATA AND INFORMATION SYSTEM**

**THE INSTITUTIONS THAT COLLECT, RECORD AND PROCESS DATA THAT PROVIDE A REPRESENTATION OF NATURAL PROCESSES AND SOCIO-ECONOMIC PATTERNS DIRECTLY OR INDIRECTLY RELATED TO DROUGHTS**

1. **NATIONAL LEVEL:**

To service a very broadly-based need for river flow data the UK maintains a network of over 1300 gauging stations. Responsibility for these stations rests principally with the Environment Agency in England and Wales, the Scottish Environment Protection Agency and in Northern Ireland, the Rivers Agency. Data from these and other measuring authorities now constitute a database of around 50,000 station years of daily and monthly flow data. In addition, monthly catchment rainfall data (mostly derived from data provided by The Meteorological Office) are routinely archived. These data are made available through a comprehensive retrieval service and are used in a number of major research projects and national monitoring programmes.

The National River Flow Archive (NRFA) is maintained by CEH Wallingford and its utility is increased by close co-operation with the National Groundwater Level Archive (a database

containing over 130,000 borehole and well records) maintained by the British Geological Survey. Both archives are major components in the National Water Archive - one of seven Designated Data Centres operated by the Natural Environment Research Council (NERC). The National Water Archive (NWA) is based at CEH Wallingford and comprises a broad range of both time series and spatial hydrological and related data. The data holdings range from the catchment scale, for example, detailed climatological and hydrological data for a network of experimental catchments, up to national river flow data and Digital Terrain Models and international coverage (e.g. world's flood archive). The NWA produces monthly hydrological summaries, annual yearbooks and occasional reports on major floods and droughts (1988-92 Drought, 1984 Drought). It also maintains a long hydrometric records archive, containing sources for long flow and groundwater series.

The Meteorological Office is responsible for maintaining a national rainfall archive and also provides forecasts of weather and tides used by hydrologists.

The Centre for Ecology and Hydrology also carries out its own catchment monitoring as part of research projects, develops instrumentation and software.

The British Hydrology Society since 1998 have developed and maintained a Chronology of British Hydrological Events. This is a wide ranging public repository, accessible on the internet, providing anecdotal evidence from a range of sources of major UK hydrological events including droughts back to 1800 and earlier.

National socio-economic data including the economy, population, the natural and built environment is available from National Statistics Online. Summaries and detailed data are published free of charge at this site.

## **2. REGIONAL LEVEL:**

In Northern Ireland, the DOE Environment & Heritage Service conducts water quality monitoring for establishing discharge consents and pollution incidents. The NI Rivers Agency (of DARDNI) is the main hydrometric agency.

Water companies, NI Water Service and the Scottish Water Authorities also maintain operational data appropriate to their function. For instance, they may provide hydrological information on rainfall & compensation flow and play a major role in assessing water resources and reservoir storage yields.

## **3. OTHER INSTITUTIONS:**

UK Universities – some active in drought research.

# **4. PLANS AND ACTIONS IN DROUGHT MANAGEMENT**

## **MITIGATION ACTIONS**

### **1. NATIONAL LEVEL:**

**England and Wales:** The Environment Agency is responsible for monitoring drought development and its environmental impact, informing the public and taking measures to mitigate the drought. The primary mitigation actions are drought permits, drought orders and emergency drought orders, as follows:

1. *Drought permits:* Environment Agency (England and Wales) can issue *drought permits* to authorise a water company to take water from specified sources or to modify/suspend conditions on water abstraction licences held by a water company.

2. *Ordinary Drought orders* are granted by the Secretary of State or National Assembly for Wales on the application of the water company or Environment Agency if it is satisfied that because of an exceptional shortage of rain, a serious deficiency of water supplies exists or is threatened or such deficiency poses a serious threat to any dependent fauna and flora. Only water companies and the Environment Agency can apply for drought orders, which last for 6 months but can be extended to up to 1 year if necessary. Drought orders can deal with discharges of water, abstractions and discharges other than by the undertaker affected, supply, treatment and filtration obligations.
3. *Emergency drought orders* are made where the Secretary of State or the National Assembly for Wales is satisfied that a serious deficiency in supplies exists or is threatened and that this deficiency will impair the economic and social well-being of persons in the area. They give the Water Company complete discretion on the uses of water that may be prohibited or limited and can authorize supply by standpipes or water tanks. The orders expire after 3 months but can be extended up to 5 months. Applications for drought orders are subject to advertisement and objection procedures.

## 2. REGIONAL LEVEL:

**England and Wales:** All Water Companies in England and Wales Water companies are required to agree a detailed, publicly available drought plan with the Environment Agency. A drought plan sets out the range of drought situations that may occur, and indicates the range and sequence of actions a company would expect to take at different stages in a drought. Agreed drought plans should help water companies to plan and progress any necessary action to meet their customers' demand for water. Operational steps may include water conservation activities such as publicity campaigns and hosepipe bans and leakage control. All water companies had drought plans in place in June 2003.

In 2004 the Environment Agency managed the drought by establishing a head office drought team and a local drought team in each of the 7 regions.

**Scotland:** The basic regime for managing drought in England and Scotland is similar. Currently, the Natural Heritage (Scotland) Act 1991 empowers Scottish Ministers to make ordinary drought orders to meet serious deficiencies of water supplies existing or threatened. If this deficiency is likely to impair the economic or social well being of persons in a locality, Scottish Ministers may make an emergency drought order. Scottish Water currently has a duty under the Water (Scotland) Act to promote the conservation and effective use of the water resources of Scotland and they are presently in the process of producing drought plans for their strategic sources which they will agree with SEPA, SNH etc. and update when the need arises.

**Northern Ireland:** Drought mitigation planning receives less attention than flood planning due to the plentiful water resources in relation to demand for Northern Ireland.

## 3. OTHER INSTITUTIONS:

### PLANNING METHODOLOGIES

#### Environment Agency

The Water Framework Directive requires that water resources are managed on a catchment basis taking full account of the needs of all stakeholders. This has led to the development of the following catchment based plans which may be relevant in times of drought.

- (i) River Basin Management Plans and Programmes of Measures, is required by the Water Framework Directive (WFD) to achieve good ecological status for water bodies. Programmes of Measures must be prepared setting out implementation mechanisms to

meet with the environmental objectives identified within the River Basin Management plans.

- (ii) Navigation (Waterways) plans provide a regeneration plan for each navigable waterway within the Environment Agency's remit focusing on the sustainable development of recreation and navigation together with the improvement of wildlife habitats.
- (iii) Catchment Abstraction Management Strategies (CAMS) propose a strategy for dealing with applications for new abstraction licences and variations, and for managing existing licences for each catchment area (or Water Resource Management Unit).
- (iv) Salmon Action Plans address local problems on individual salmon rivers and implement objectives of the National Salmon Management Strategy (NRA, 1996).
- (v) Water Level Management plans aim to provide a means by which the requirement for water levels of rivers, reservoirs and other surface water bodies for a range of activities in a particular area, including agriculture, flood defence and conservation can be integrated and balanced.
- (vi) A national water resources strategy, "Water resources for the future", looks some 25 years ahead and considers the needs of public water supply, agriculture, commerce and industry, as well as the environment. It is supported by eight regional detailed strategies covering England and Wales.

## **ANNEX III - FRANCE REPORT**