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INECO

Institutional and Economic Instruments for Sustainable Water Management in the Mediterranean Region

Coordination Action

DELIVERABLE NO 2

SYNTHESIS REPORT ON THE APPLICATION OF INSTITUTIONAL AND ECONOMIC INSTRUMENTS IN THE WATER SECTOR FOR ARID AND SEMI-ARID REGIONS

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Preface

The present document is the Deliverable 2, "Publishable synthesis report on the application of institutional and economic instruments in the water sector for arid and semi-arid regions", of the INECO project (Contract no: INCO-CT-2006-517673). The Deliverable was prepared by International Office for Water, and presents the work undertaken in the framework of Task 2 of Work Package 2 of the INECO project.

The overall objectives of Work Package 2 *"Exchange and dissemination of best available practices for institutional and economic instruments in constructively engaged IWRM"* are to:

- Exchange information and disseminate previous research efforts of the consortium regarding the application of institutional and economic instruments for meeting the goals of Integrated Water Resources Management.
- Disseminate the review of experiences gathered from the harmonisation procedures adopted in the European Mediterranean Countries for the adaptation of institutional frameworks to the WFD requirements.
- Present institutional and economic instruments adopted in arid and semi-arid developed countries

In the framework of WP 2, Task 2.2 *"Review of approaches used in the developed world"*, aimed at reviewing the problems and experiences associated with institutional and economic interventions in the water sector in non EU world countries, focusing particularly in arid and semi-arid regions.

The review aimed at highlighting drawbacks, accomplishments, advantages and disadvantages of institutional and economic reforms in the water sector, through the review of practices and structures adopted in several non-EU countries: Argentina, Australia, California, Canada, Chile, Israel and Japan, as well as the context (cultural and political) in which water policy is pursued and implemented. The objective is to provide examples of strategic approaches towards Integrated Water Resource Management, in order to initiate a discussion on alternative options that could be implemented in Southern Mediterranean countries.

This deliverable is organized in the following way:

- Chapter 1 provides a brief introduction to the INECO Project context and conceptual framework.
- Chapters 2 to 8 provide a description of the context and applied strategic water management approaches in the following countries: Argentina, Australia, California, Canada, Chile, Israel and Japan. Focus is given to the water administration and governance, including public participation (Governing Water), water allocation and water rights administration (Sharing Water) and water pricing and infrastructure financing (Valuing water).
- Finally, Chapter 9 summarizes some critical institutional and economic issues, typical of arid and semi-arid countries.

1. Introduction

1.1 The INECO project context

The main goal of the INECO project is to promote capacity building for constructively engaged Integrated Water Resources Management (IWRM), emphasizing on socioeconomic and policy considerations for the application of institutional and economic instruments.

Integrated Water Resources Management (IWRM) has been defined by the Global Water Partnership (2000), as *"a process promoting the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems"*.

In an ideal IWRM situation, water resources are managed on (sub-) basin level in a globally sustainable way, balancing different aspects, i.e. technical, financial, social, economic, institutional and environmental. At the same time, the water-related interests of all stakeholders are considered in decision making on water use, while all stakeholders and interested parties have access to relevant information and are aware of the potential of the water source and the impact of their use on the other stakeholders. Decisions on water use and associated costs of service provision are made in a participatory manner, taking into account criteria agreed and goals accepted by all stakeholders.

INECO focuses on institutional and economic instruments, which in their turn are associated with three management challenges, which are briefly analyzed in the paragraphs that follow:

- **Sharing water**, referring to the mechanisms (institutional, regulatory, legislative, economic) in place for water allocation at the river basin level (between uses), at the service provision level (between users) and at the transnational level (if relevant).
- **Valuing water**, referring to the assessment of costs and values in water use, the maximisation of economic efficiency, the implementation of the cost-recovery principle for supporting sustainable water service delivery, and the implementation of the user-pays and beneficiary-pays principles.
- **Governing water wisely**, referring to the provision of an environment that enables IWRM implementation and focusing on the aspects of:
  - Participation of all citizens in the decision-making process, either immediately or through organisations representing their interests;
  - Decentralisation and application of the subsidiarity principle;
  - Transparency of water-related decisions, especially in relation to water allocation, water service revenue and investment capital allocation, and definition of water charges;
  - Equity, ensuring that all citizens are being treated equally and have equal opportunities in water use;
  - Accountability, with regard to decisions taken;
  - Coherence and integration between policies and goals;
  - Responsiveness with regard to changes in demand, supply, development goals or extreme hydrological events.

1.1.1 Governing water systems

The water crisis is essentially a crisis of governance and societies are facing a number of social, economic and political challenges on how to govern water more effectively. The way in which societies organize their water resource affairs is critical for promoting and supporting sustainable development as an integral part of a poverty-focused development strategy. In essence, water governance refers to the range of political, social, economic and administrative systems that are in place to develop and manage water resources and the delivery of water services, at different levels of society (UNESCO-WWAP, 2003). Principles are summarized in Table 1.

Table 1: Principles relating to the "Governing water wisely" challenge

Principles	**Description / remarks**
Integrated Water Resources Management should be applied at catchment level.	The catchment should be considered as the smallest complete hydrological unit of analysis and management. Integrated catchment management (ICM), therefore, becomes the practical operating approach.
It is critical to integrate water and environmental management.	IWRM can be strengthened through the integration of Environmental Impact Assessments (EIA's), water resources modeling and land use planning. A catchment approach implies that water should be managed alongside the management of codependent natural resources, namely soil, forests, air and biota.
It is absolutely necessary that there is a full participation by all stakeholders, including workers and the community	This will involve new institutional arrangements. There must be a high level of autonomy. This must at the same time be associated with transparency and accountability for all decisions.
Stakeholders must collaborate in designing and implementing strategic elements of capacity building as part of the evolving IWRM process.	/
The role of women in water management must be strengthened.	A review by the World Bank of 121 water projects has shown that ensuring women's participation in decision-making positively affects both project quality and sustainability.
Information should be available and should be used to make policy and predict responses.	This implies, firstly, sufficient information on hydrological, bio-physical, economic, social and environmental characteristics of a catchment to allow informed policy choices to be made; and secondly, some ability to predict the most important responses of the catchment system to factors such as effluent discharges, diffuse pollution, changes in agricultural or other land use practices and the building of water retaining structures. The latter hinges on the adequacy of scientific models: Models should be as complex as the problem requires and no more so.
The role of central government in ICM should be one of leadership aimed at facilitating and coordinating the development and transfer of skills, and assisting with the provision of technical advice and financial support, to local groups an individuals.	Where specific areas of responsibility fall outside the mandate of a single government department, appropriate institutional arrangements are required to ensure effective inter-departmental collaboration. Effective IWRM is a top-down meets bottom-up process.

Principles	Description / remarks
A systems approach should be applied.	A true systems approach recognizes the individual components as well as the linkages between them, and that a disturbance at one point in the system will be translated to other parts of the system. Sometimes the effect on another part of the system may be indirect, and may be damped out due to natural resilience and disturbance. Sometimes the effect will be direct, significant and may increase in degree as it moves through the system. While systems analysis is appropriate, analyses and models that are too complex to be translated into useful knowledge should be avoided.
The best existing technologies and practices should be adopted.	This includes management instruments.

Source: http://www.gdrc.org/uem/water/iwrm/1pager-01.html

1.1.2 Valuing water

It is widely recognized that water has traditionally been regarded as a free resource of unlimited supply with zero cost at supply point and at best, water users have been charged only a proportion of the costs of extraction, transfer, treatment and disposal (UNESCO-WWAP 2003). All associated externality costs of water have been ignored and users are offered limited incentives to use water efficiently and not waste it. Major arguments for assigning price for the use of water have mostly originated from these concerns. Because costs of water supply delivery have escalated, it has become clear that economic measures such as pricing in general and demand management instruments have a distinct role to play in ensuring more efficient use of water. Principles and implications related to water pricing, allocation of costs and economic efficiency are summarized in Table 2.

Table 2: Principles relating to the "Valuing water" challenge

Principles	Description / remarks
Full-cost pricing must be implemented and complemented by targeted subsidies.	Users do not value water provided free or almost free, and have no incentives to conserve water. There is a significant opposition from people who felt that, because of the implementation of this principle, the interests of the poor might not be sufficiently protected, even under an associated well designed subsidy system. Others held that full-cost pricing, when applied in its narrowest sense, offends the principle that water is a public good, a human right, and not simply an economic good. Nevertheless, the economic sustainability of water and sanitation services depends largely and appropriately on the recovery of costs through user fees or tariffs that are equitably assigned based on ability-to-pay. Under-served or unserved, marginalized users in many places already pay high financial costs of not having safe piped water, for example, because they are forced to pay for water trucked-in by suppliers.
Financing must be reliable and sustained	In order to ensure successful implementation of IWRM approaches, there should be a clear and long-term commitment from government to provide financial and human resources support. This is complemented by income from a healthy water and sanitation market, especially when local providers of goods and services that support the water sector are active players, and when there is active reinvestment in the sector.

Principles	Description / remarks
Water should be considered as an economic good	The recognition of water as an economic good is central to achieving equitable allocation and sustainable usage. Water allocations should be optimized by benefit and cost, and aim to maximize water benefits to society per unit cost. For example, low value uses could be reallocated to higher value uses such as basic drinking water supplies, if water quality permits. Similarly, lower quality water can be allocated to agricultural or industrial use.

Source: http://www.gdrc.org/uem/water/iwrm/1pager-01.html

1.1.3 Sharing water

Water is essential to national economic and social development, in the areas of health, food, industry and energy. As a resource that transcends most political and administrative boundaries, the world's available freshwater must be shared among and between individuals, economic sectors, intrastate jurisdictions and sovereign nations, while respecting the need for environmental sustainability (UNESCO-WWAP, 2003). The challenges surrounding the equitable sharing of water resources are complex and have intensified in recent years due to population growth, development pressures and changing needs and values. There is already growing competition between different development sectors in countries, to varying degrees. This has placed increasing strain on freshwater supplies both in terms of quantity and quality, resulting in tensions and, indeed, conflict between uses, users and across political boundaries. Table 3 attempts to summarize principles related to the "Sharing water resources" challenge.

Table 3: Principles relating to the "Sharing water" challenge

Principles	Description / remarks
Integrated Water Resources Management should be applied at catchment level.	The catchment should be considered as the smallest hydrological unit of analysis and management. Therefore, Integrated Catchment Management (ICM) becomes the practical operating approach.
Attention should be pay to social dimensions.	The use of social impact assessments, workplace indicators and other tools should be used to ensure that the social dimension of a sustainable water policy is implemented. This includes: – Promotion of equitable access, – Enhanced role of women,and – Assessment of employment and income implications due to the shift towards an IWRM approach.
Allocation of water resources must be equitable	This implies improved decision-making, which is technically and scientifically informed, and can facilitate the resolution of conflicts over contentious issues, and between sectors.

Source: http://www.gdrc.org/uem/water/iwrm/1pager-01.html

1.2 Aim and scope of this report

The aim of this deliverable to provide background information on the application of institutional and economic instruments that could meet the sustainability goals of Integrated Water Resources Management. The purpose is to provide examples of strategic approaches towards Integrated Water Resource Management, in order to initiate a discussion on alternative options that could be implemented in Southern Mediterranean countries. The following chapters review different instruments and tools applied in several countries, classified to the three challenges of Integrated

Water Resource Management analysed within the project, i.e. Governing water systems, Valuing water, and Sharing water. Chapters 2 to 8 provide a brief description of the context and applied approaches in the following countries: Argentina, Australia, California, Canada, Chile, Israel and Japan. Chapter 9 provides a summary of the review, and some further views and insight on the issue of economic instruments in water allocation.

2. Argentina

Argentina has a total surface of 2,766,890 km²[1], comprising 2,736,691 km² of land and 30,200 km² of water. The country is nearly 3,700 km long from north to south, and 1,400 km from east to west (maximum values), and can roughly be divided into four parts: the fertile plains of the Pampas in the center the country, the source of Argentina's agricultural wealth; the flat to rolling, oil-rich plateau of Patagonia in the southern half down to Tierra del Fuego; the subtropical flats of the Gran Chaco in the north, and the rugged Andes mountain range along the western border with Chile.

Argentina's climate is generally temperate; however there are great variations, from the extreme heat of the northern Chaco region, through the pleasant mild climate of the central pampas, to the subantarctic cold of the glacial regions of southern Patagonia. The highest temperature, 49°C, has been recorded in the extreme north, and the lowest, –16°C, in the southern tip of the country. Rainfall diminishes from east to west. Rainfall at Buenos Aires averages 940 mm annually, and the mean annual temperature is 16°C. Throughout the country, January is the warmest month and June and July are the coldest. North of the Río Negro, the winter months (May–August) constitute the driest period of the year. The wide variations of climate are due to the great range in altitude and the vast extent of the country. In the torrid zone of the extreme north, for example, the Chaco area has a mean annual temperature of about 23°C and a rainfall of about 760 mm, whereas Puna de Atacama has a temperature average of 14°C and a rainfall of about 50 mm. The pampas, despite their immensity, have an almost uniform climate, with much sunshine and adequate precipitation. The coldest winters occur not in Tierra del Fuego, which is warmed by ocean currents, but in Santa Cruz Province, where the July average is 0°C.[2]

Major rivers in Argentina include the Pilcomayo, Paraguay, Bermejo, Colorado, Río Negro, Salado, Uruguay and the largest river, the Paraná. The latter two flow together before meeting the Atlantic Ocean, forming the estuary of the Río de la Plata. Regionally important rivers are the Atuel and Mendoza in the homonymous province, the Chubut in Patagonia, the Río Grande in Jujuy, and the San Francisco River in Salta.

There are several large lakes in Argentina, many of them in Patagonia. Among these are lakes Argentino and Viedma in Santa Cruz, Nahuel Huapi in Río Negro and Fagnano in Tierra del Fuego, and Colhué Huapi and Musters in Chubut. Lake Buenos Aires and O'Higgins/San Martín Lake are shared with Chile. Mar Chiquita, Córdoba, is the largest salt water lake in the country. There are numerous reservoirs created by dams. Argentina features various hot springs, such as those at Termas de Río Hondo with temperatures between 30°C and 65°.

2.1 Governing water systems

The **Secretariat of Natural Resources and Environment** was created in 1991. Its name was changed in 1996 to the Secretariat of Natural Resources and Sustainable Development, overseen by the office of the President.

[1] Not including the Antarctic claim.
[2] http://en.wikipedia.org/wiki/Argentina

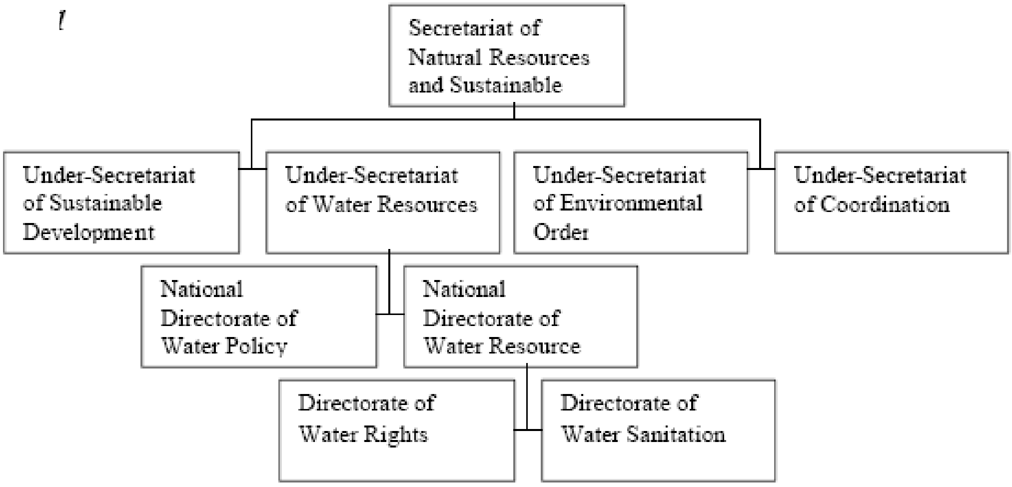

Figure 1: Organizational chart of Secretariat of Natural Resources and Environment

The Under-Secretariat of Water Resources oversees the National Bureau of Water Policy, which is in charge of planning and executing the national water policy, supervising compliance and coordinating plans, programmes and projects related to water resources, and the National Bureau of Water Resources Administration, which is essentially responsible for proposing and executing policies, programmes and projects related to public water works.

The Decentralized Agencies of the Secretariat of Natural Resources are the:

- **National Institute for Water and the Environment** (INA), whose objective is to meet the requirements of studying, researching, developing and providing specialized services in the field of water and environmental development, control and preservation, with the overall aim to implement and develop the national environmental policy;
- **National Sanitation Works Agency** (ENHOSA), which assisted the former National Sanitary Works company, as well as provinces and municipalities, in sector development by granting loans for the construction, rehabilitation and optimization of drinking water and sewerage works, and with the institutional and operational improvement of service providers.
- **Federal Council on the Environment** (COFEMA) is a permanent agency created on August 31, 1990 as a public enterprise to reach agreement on and prepare an environmental policy coordinated among member states. It is an inter-jurisdictional agency in which the country, the city of Buenos Aires and all provinces are represented.

Three **Watershed agencies** are formally established and operational. These are:

- Inter-jurisdictional Committee for the Colorado River (COIRCO). It comprises the federal government and the provinces of Buenos Aires, Mendoza, La Pampa, Neuquén and Río Negro and has its own statutes and bylaws. Its objective is to ensure the execution of the single program to prepare irrigation areas and distribute river volumes.
- Regional Commission for the Bermejo River (COREBE), comprising the federal government and the provinces of Chaco, Formosa, Jujuy, Santa Fe and Santiago del Estero. Its objective is to adopt decisions and carry out the administration of actions needed for the comprehensive, rational and multiple development of water resources in the river basin.
- Inter-jurisdictional Authority for the Watersheds of the Limay, Neuquén and Negro Rivers is an authority created by the treated signed by the federal government and the Provinces of

Neuquén, Rio Negro and Buenos Aires in 1985 to deal with all matters related to the administration, control, use and development, and preservation of watersheds.

With the intervention of the Bureau of Water Policy, work is being carried out on the formation of the following agencies:

- Inter-jurisdictional Commission on the Laguna La Picasa Watershed with the participation of the Provinces of Buenos Aires, Córdoba and Santa Fe.
- Watershed Committee of the Pasaje River-Juramento-Salado with the participation of the Provinces of Salta, Santiago del Estero, Catamarca, Santa Fe and Tucumán.
- Watershed Committee of the SALI DULCE River. This involves, within its territory, the provincial jurisdictions of Salta, Santiago del Estero, Tucumán, Catamarca and Córdoba.
- Watershed of the Abaucan-Colorado Salado River. This involves the provinces of Catamarca and La Rioja.

2.2 Valuing Water

Each province has and regulates its own financial charges, with different modalities according to the importance it places on the resource; the issue is generally treated by all provincial water legislation. There are basically three types of taxes paid by public water users:

- Ownership taxes such as the usage or royalty tax and the dumping tax;
- Tax fees or quotas for services such as channel cleaning, maintenance of works, contributions to users' organizations to cover administrative costs;
- Contribution for improvements from the construction of works benefiting farms that have been granted water rights.

As a means to obtain tax payment, the laws stipulate the following:

- *Certificate of Free Debt:* This means that a public deed cannot be extended or recorded in the Property Registry unless it is first authorized by a certificate issued by the water authority stating that the bearer does not own any amount for obligations stemming from his water right.
- *Fines and/or Suspension of Water Supply:* Non-compliance with obligations first generates fines and, if it persists, will lead to suspension of water supply.
- *Administrative Notification:* This corresponds to extra-judicial collection as a means of pressure, before resorting to judicial collection.
- *Judicial Collection*: A court order is imposed (fiscal enforcement procedure), with the debt certification issued by the water titling serving as proof.

Water pricing in the **Province of Mendoza** is effected according to the following principles and rules (Law 6.044/93 and Decree 911/95):

- Tariffs are set by the Executive Branch and are effective for five years at the proposal of the Provincial Water and Sanitation Agency (EPAS).
- The Executive Branch may decree water service subsidies for household consumption, compensating the operator for the subsidized amount.
- For the purpose of settling the Regulatory Agency's operating cost, the concessionaire shall bill users for inspection, control and sanitation fees.
- Operators shall have the right to charge for all works and activities directly or indirectly linked to the service rendered, charge for connection and disconnection fees, and charge for

providing block drinking water and sewerage and other items stipulated in the concession contract.

- Individuals and companies, including national, provincial or municipal agencies that will be beneficiaries of the service, are obliged to pay tariffs.

With regard to concession contracts, concessions are acquired by purchase, corresponding to the payment of a tax. The annual amount to be paid will stem from the application of the percentage established for the tax to the concessionaire's operating income during the fiscal year considered.

In the **Province of Catamarca**, Law 4963 stipulates the following:

- Drinking water and sewerage service providers shall pay the provincial government a tax on the public water they use, which shall be consigned in the corresponding contracts.
- Tariffs for services supplied to users should reflect the economic cost of services rendered based on the rational and efficient use of such services and the resources used to supply them.
- The tariff scheme will be revised every five years in the manner and procedure determined by the contract and the Regulatory Agency.
- Tariff modification is the responsibility of the Regulatory Agency, following a public hearing on the matter.

In the Province of La Rioja (Law 6.281):

- All providers of natural water services may request a free or paid special use concession on waters needed for such service.
- The concession and control over the use of the resource is the responsibility of the Provincial Water Bureau;
- All providers may request free use of receiving waters needed to provide service.
- Providers may market their surplus production of drinking water or of their sewerage or waste treatment capacity, with prior communication to the Regulatory Agency.
- Tariff Regulations:
  - The Regulatory Agency is responsible for determining tariffs as well as enforcing their control.
  - The tariff scheme should be governed, among other principles, by being uniform throughout the province and reflecting the economic cost of providing the service.
  - Service providers may grant direct subsidies on the payment of tariffs by low-income users and such grant shall apply to maintaining the economic and financial balance of providing the service.

In the Province of Juju, the principles upon which the tariff scheme should be based, for drinking water and sanitation works (Art. 7 law 4090 of 1984), have an eminently social meaning. Currently, the company responsible for providing this service, Agua de los Andes, uses as an argument for not covering a tax for water it distributes.

2.3 Sharing water - The experience of Aguas Argentina

In 1993 the concession for the city of Buenos Aires was awarded to Aguas Argentina a consortium of Suez, Vivendi, Aguas de Barcelona (Suez-controlled) and Anglian Water.

In February 2001, Expansion reported that Aguas Argentina had been fined US$600,000 for overcharging consumers or, more precisely, for levying undue charges ("cobros indebidos"). Aguas Argentinas had to refund the amounts charged in excess to consumers. Also, in September 2001, a court ruling ordered Aguas Argentinas to halve water tariffs to 60,000 commercial users who, according to consumers, had been charged a total of Peso 240m in excess in six years.

In January 2001, Suez announced that it had renegotiated the Aguas Argentinas concession to provide for the "social costs" of connecting low-income consumers who could not afford to pay. Aguas Argentinas was faced with a loss of $60m as it was unable to collect connection charges for new extensions in poor areas. The company was thus allowed to apply cross-subsidy by charging better-off clients to cover these 'social' costs (Hall and Lobina, 2002). By the end of 2001 the concession had experienced a number of problems and was embroiled in the Argentinean economic crisis. In 2006, Suez decided to leave Buenos Aires.

2.4 Civic engagement: an example of Social Protest for Water in Tucuman

Probably the most well known example of the possible conflict over water privatization is the case of **Cochabamba, Bolivia**. The Cochabamba protests of 2000 were a series of protests that took place in the Bolivian city of Cochabamba between January and April 2000, because of the privatization of the municipal water supply. Demonstrations erupted when Aguas de Tunari imposed a large rate increase, reportedly to finance the Misicuni Dam project, a week after taking control of the Cochabamba water supply system. In mid-January, Cochabamba residents shut down their city for four straight days with a general strike led by a new alliance of labour, human rights and community leaders. After violent demonstration, on April, the government finally conceded, signing an accord that agreed to every demand the protesters had made.

However, before Cochabamba, Argentina faced a strong conflict relating to water privatization. In 1993 in Tucuman, Argentina's smallest province, the Compagnie Generale des Eaux (Veolia Water), French operator of the water and sewer services (called Aguas del Aconquija in the province), won the privatization bid for the province's water and sewer services concession.

When the company took over operations in 1995, it raised the price of services by 104%. Many citizens of Tucuman considered this to be a violation of their rights, a burden to their income and quality of life. They organized and resisted until, three years later, the Compagnie Generale des Eaux was asked to withdraw.

The company had to face a "civil disobedience" action: the refusal to pay for water and sewer services. The first to organize themselves were the towns in the interior of the province, located in the region of sugar cane production, where there was a long experience of struggle. At first, seven small cities formed a coordinating committee, and later established the national Association in Defense of the Consumers of Tucuman (the Asociacion en Defensa de Usuarios y Consumidores de Tucuman-ADEUCOT). The culminating moment in the struggle was the decision to not pay for service. Women played a very important role in the protest. They have led in organizing both public and private meetings, and persisted in maintaining the payment boycott (Giarracca N., 2006).

3. Australia

Australia is a large country, with an area of 7.69 million km^2 and a relatively small population of just over 20 million people in 2005. The country has a total 25,760 km of coastline and claims an extensive Exclusive Economic Zone of 8,148,250 km^2. This exclusive economic zone does not include the Australian Antarctic Territory. The western half of Australia consists of the Western Plateau, which rises to mountain heights near the west coast and falls to lower elevations near the continental center. The Western Plateau region is generally flat, though broken by various mountain ranges such as the Hamersley Range, the MacDonnell Range, and the Musgrave Range. Surface water is generally lacking in the Western Plateau, although there are several larger rivers in the west and north such as the Murchison, Ashburton, and Victoria rivers. The Eastern Highlands, or Great Dividing Range, lie near the eastern coast of Australia, separating the relatively narrow eastern coastal plain from the rest of the continent. The Eastern Highlands have the greatest relief, the most rainfall, the most abundant and varied flora and fauna, and the densest human settlement. Between the Eastern Highlands and the Western Plateau lie the Central Lowlands, which are made up of the Great Artesian Basin and Australia's largest river systems, Murray-Darling Basin and Lake Eyre Basin.

The Great Artesian Basin - an important source of water, it is the world's largest and deepest fresh water basin. A number of towns and cities across the country are facing major water storage and usage crisis in which restrictions and other measures are taken to reduce water consumption[1]. The Great Artesian Basin provides the only reliable source of water through much of inland Australia. The basin is the largest and deepest artesian basin in the world. It underlies 23% of the continent, including most of Queensland, the south-east corner of the Northern Territory, the north-east part of South Australia, and northern New South Wales. The basin is 3000 m deep in certain areas and is estimated to contain 64,900 km^3 of groundwater.

The aquifers that make up the Great Artesian Basin are composed of layers of quartzose sandstone laid down by continental erosion of higher ground during the Triassic, Jurassic, and early Cretaceous periods, and covered by a layer of marine sedimentary rock laid down shortly afterwards, during a time when much of what is now inland Australia was below sea level. Most recharge water enters the rock formations from relatively high ground near the eastern edge of the basin (in Queensland and New South Wales) and very gradually flows towards the south and west. (A much smaller amount enters along the western margin in arid central Australia, flowing to the south and east.) Because the sandstones are permeable, water gradually makes its way through the pores between the sand grains, flowing at a rate of 1 to 5 m per year.

These aquifers are the source of most of the water used in the area. The basin is an important source of water for cattle breeding. Whilst unsuitable for irrigation, water is adequate for stock and domestic usage (with treatment) and is thus vital to human activity[2].

Concerning climate, the largest part of Australia is desert or semi-arid – 40% of the landmass is covered by sand dunes (Figure 2). Only the south-east and south-west corners have a temperate climate and moderately fertile soil. The northern part of the country has a tropical climate: part is tropical rainforests, part grasslands, and part desert. Rainfall is highly variable, with frequent droughts lasting several seasons thought to be caused in part by the El Niño-Southern Oscillation.

[1] http://en.wikipedia.org/wiki/Geography_of_Australia
[2] http://en.wikipedia.org/wiki/Great_Artesian_Basin

Australia's tropical/subtropical location and cold waters off the western coast make most of western Australia a hot desert with aridity, a marked feature of greater part of the continent. These cold waters produce precious little moisture needed on the mainland. Compared to the earths other continental landmasses, Australia is very dry. More than 80% of the continent has an annual rainfall of less than 600 mm[1].

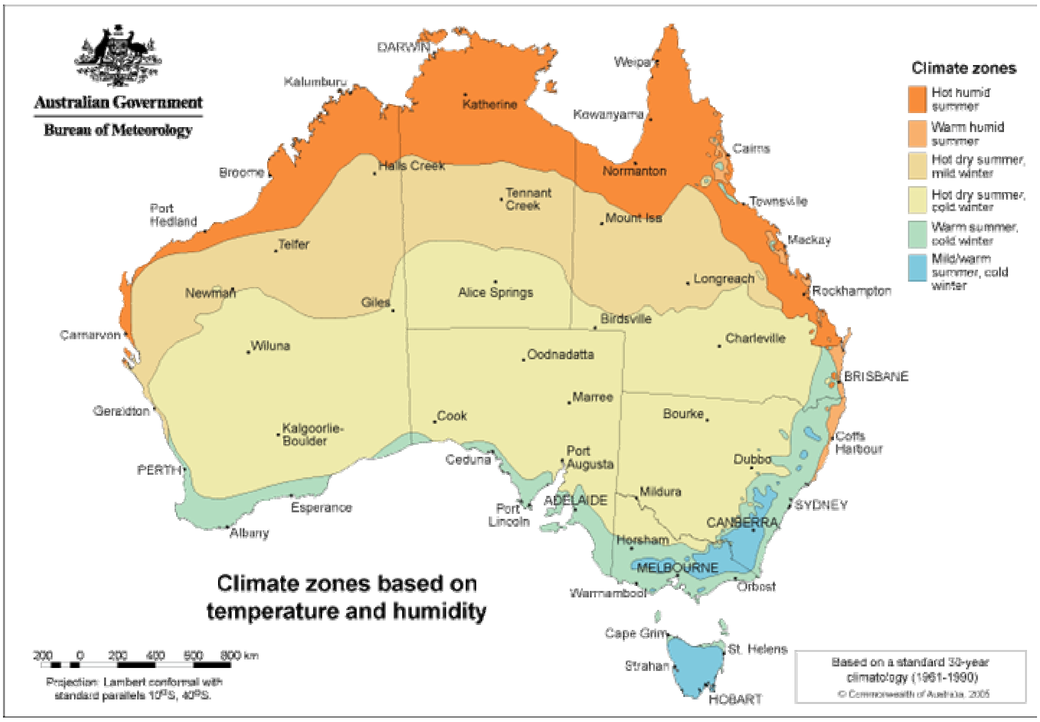

Figure 2: Climate zones of Australia (Source: Australian Government, Bureau of Meteorology)

Agriculture now accounts for an insignificant 3% of GDP and only 6.88% of the total area is used for arable cropping. Only 5% of the labour force was engaged directly in agriculture in 1997, compared to 22% in industry and 73% in the service sector (Facts about Australia, 2006). However, the irrigation industry is the major user of freshwater in Australia, accounting for 70 to 80% of the total water consumption. It provides several benefits to the country, but at present, the sector faces a number of challenges, regarding the:

- Infrastructure decline (with insufficient public funds to pay for rehabilitation/renewal),
- Low profitability in general, and
- Natural resource and environmental degradation such as declining water quality and water tables and increased river and groundwater salinity.

3.1 Governing water systems

Australia is a democratic federation of 6 States and 2 Territories, united by the Commonwealth Government (Federal Government). Cohesion within this structure is enforced through the centralization of income tax collection, the revenue of which is then re-distributed to the nine (Central, State and Territory) governments. There is a third layer of local government at municipal (urban) and shire (country) levels. States, Territory and local governments can also raise some local revenue (e.g. States via petrol levies and local government via service levies).

[1] http://en.wikipedia.org/wiki/Geography_of_Australia

Water is the responsibility of State and Territory governments (henceforth referred to as 'States' or jurisdictions) under the Australian constitution. Each has independent water laws and distinct policies. However, international issues, common jurisdictional concerns, and Commonwealth leverage of Section 96 of the Australian Constitution (which allows the Commonwealth to grant financial assistance to any State on terms determined by the Commonwealth) have accelerated the development of a Federal role in national water policy (Tullar and Fullagar, 2005).

Issues of national significance, which concern the Commonwealth and all State governments, are the responsibility of the Council of Australian Governments (COAG). The COAG is able to deal with a wide range of issues through a number of Ministerial Councils. These Councils facilitate development and implementation of national plans and proposals which would otherwise be impinged by the division of constitutional powers between the Federal and State governments.

3.1.1 Focus on Watershed management in New South Wales

The concept of catchment management emerged in the early 1980s in New South Wales. In 1986, the catchment management policy was formally endorsed by New South Wales government (Fidelman et al., 2005). Such policy aimed at ensuring the coordinated use of land, water, vegetation and other natural resources on a watershed basis, emphasising community participation and voluntary implementation. In 1989, the Catchment Management Act was introduced, and formalised the first state-wide statutory catchment management policy in Australia. The Catchment Management Regulation was enacted in 1999, introducing changes in the catchment management framework. Recently further changes were introduced by enacting the Catchment Management Authorities Act in 2003, which repealed both the Catchment Management Act and the Catchment Management Regulation (Fidelman et al., 2005).

Following the adoption of the catchment management policy in the mid 1980s, the first catchment management groups began to emerge in New South Wales. These groups comprised mostly locally or regionally-based staff from State government agencies and local government. Such groups were the precursors of the Catchment Management Committees (CMCs) established later by the Catchment Management Act of 1989. The New South Wales and Catchment Management Trusts (CMTs) constituted regional bodies responsible for coordinating catchment management at the watershed level. One of the main differences between the two bodies was that the Catchment Management Trusts could raise and administer funds, and undertake ground works. Over forty Catchment Management Committees represented, however, the prevalent catchment management bodies in New South Wales. Each Catchment Management Committee was formed by a majority of resource users or land holders, plus environmental interests, local and state government representatives, appointed by the Minister of Land and Water Conservation. Staff and other support were provided by the New South Wales Department of Land and Water Conservation, the then leading State agency for catchment management. Despite being statutory, the Catchment Management Committees were advisory bodies only. For example, the CMCs strategies/plans had no legal authority; implementation relied mostly on voluntary action, and to some extent on the provisions of related policies. The State Catchment Management Coordinating Committee provided coordination for the Catchment Management Committees and Catchment Management Trusts across the State.

The Catchment Management Regulation (1999) replaced the Catchment Management Committees with 18 Catchment Management Boards (CMBs). Coastal Catchment Management Boards had jurisdiction over larger areas and, therefore, had a more regional focus than the former coastal

Catchment Management Committees. The areas of coastal Catchment Management Committees also extended to 3 nautical miles seaward, encompassing the State waters. The membership composition of the catchment management bodies was modified to include representatives from the aboriginal community, in addition to representatives from resource users, nature conservation, local and state government. The short life of the Catchment Management Boards was dedicated primarily to the development of an integrated catchment management plan (the Catchment Blueprint) for their respective areas, which was accomplished shortly before their termination.

In early 2004, the Catchment Management Boards were disbanded and 13 Catchment Management Authorities (CMAs) were established under the Catchment Authorities Act 2003. Most of the coastal Catchment Management Authorities operate within even larger areas than the coastal Catchment Management Boards. The CMAs are independent bodies that report directly to the Minister of Natural Resources and the Minister of Infrastructure and Planning, and are no longer under the responsibility of a State government agency, as were the CMCs and Catchment Management Boards. Each board of the Catchment Management Authorities comprises between five and seven members from the community, appointed by the Minister based on their knowledge and skills, rather than on representation of particular interest groups. The Catchment Management Authority board members are employed on a part-time basis by the New South Wales Government, whereas, in the past, members of the catchment management bodies participated mostly on a voluntary basis. Unlike the former catchment management bodies, the Catchment Management Authorities are better resourced, both in terms of human resources and in terms of funding. As part of the Catchment Management Authorities structure, a general manager and other staff are employed. Additional corporate support services, such as financial management and legal support are provided by the NSW Department of Infrastructure, Planning and Natural Resources. The CMAs have an initial budget of USD $ 336 million over four years, of which $ 120 million are committed to native vegetation and targeted on-farm incentives. In addition to an advisory role, similar to their predecessors, the CMAs have governing and operational roles, including the development of plans, investment on ground works, community education and support, and approval of property vegetation plans. The structure and roles of the new CMAs may suggest that catchment management institutions in NSW are moving from a community-based model towards a quasi-government system.

3.2 Valuing Water

3.2.1 Water pricing and the principle of full cost recovery

In 1994, all State and Territory governments agreed that the management and regulation of Australia's water needed significant changes. They agreed on a package of reforms including changes to water prices, allocation, environmental and water quality issues, and water trading. The reforms aimed at promoting good water management practices and ensuring the development of strategies to promote water uses that make good business sense, are good for the environment and ultimately ensure the long term sustainability of water resources. Given the importance of the reform to the environment and the economy, in 1995 the Council of Australian Governments (CoAG) decided that implementation of the reforms would be included under the umbrella of National Competition Policy.

By agreeing to the proposed changes, the governments formally acknowledged, for the first time, that Australian rivers, catchments and aquifers do not stop at State boundaries and that a development activity in one State can have impacts thousands of kilometres away, in other States.

One of the key elements of the reform was that all water pricing policies were to be based on the principles of full cost recovery and transparency of cross-subsidies. (All about Water: Australia's water resources, 2006). At an average price of around 1 Australian dollar per m^3, the price of water in Australia, compared with other countries and with other products, is very low and as such is not providing any incentive to households for water conservation. It has been possible to keep water prices low because neither the costs of abstracting the water from the environment nor of protecting the catchments from which it is collected are required to be included in the current "full cost recovery" pricing regimes. Similarly, the costs of stormwater runoff are not attributed. A block of land covered with impervious surfaces, such as roofs and parking lots, is charged no more in drainage fees than a block with a large garden and minimal runoff of similar size. (Urban Ecology Australia, 2006).

3.2.2 Water Trading and Prices in the Murray-Darling Basin

The Origin of Water Trading

Water trading was introduced in Australia in the early 1980s to encourage a shift to more efficient water uses and to activate water entitlements that were not being used. The development of a water trading system was one of the major requirements for the set of Council of Australian Governments Water Reforms, established in 1995.

The major area that is at the forefront of water trading is the Murray-Darling Basin. Since the 1950's the quantity of water diverted from the rivers of the Murray-Darling Basin increased substantially. While the development of the Basin's water resources has brought many social and economic benefits, through activities such as irrigation, it also affected adversely the health of the river systems.

In 1995 an audit of water use was commenced in the Basin. The audit showed that if the volume of water diversions continued to increase, this would exacerbate river health problems, reduce the security of water supply for existing irrigators in the Basin and reduce the reliability of water supply during long droughts. Therefore, a limit called the "Cap" was imposed on the volume of water which could be diverted from the rivers for consumptive uses.

While the Cap restrains further increase in water diversions, it does not constrain new water resource developments, provided that the corresponding quantity is obtained by using water more efficiently or by purchasing water from existing schemes. For New South Wales and Victoria, the Cap was defined as the volume of water that would have been diverted under 1993/94 levels of development, subject to two small allowances that will be made for the Pindari Dam (New South Wales) and the Mokoan Storage (Victoria); diversions were capped at 1993/94 levels for New South Wales, Victoria and South Australia. As a result of the Cap there will be no more increases in the water available for off-stream use in the Basin beyond that provided for under the Cap. Thus, in order to meet the continuing increase in the demand for water and to achieve the environmental and economic sustainability of the Basin, a greater efficiency in the allocation and use of the limited water resources was to be achieved.

To this end, water trading within the framework of strict environmental constraints is seen as one of the main mechanisms available to achieve the desired efficiency improvements. The importance of water trading has been recognised by the Council of Australian Governments (COAG) Water Reform agenda. This agenda has as key objective to encourage water use which will achieve its highest value among both consumptive and non-consumptive uses, while ensuring that the use is ecologically sustainable.

Water trading and property rights

A significant part of the Council of Australian Governments' Water Reform agenda has been the establishment of clear water property rights in all States and territories, as water trading should be based on a clear separation of water property rights from land titles.

Until relatively recently, this was not the case. The only way that a water trade could take place was by selling land with a linked water entitlement to an existing irrigator and the subsequent amalgamation of the two entitlements.

This direct link between water and land is in the process of being broken in each State and increasingly water entitlements can be traded independently of land (All about Water: Australia's water resources, 2006).

3.3 Sharing water

Groundwater and surface water are both licensed by or on behalf of State governments, under state-specific water legislation and policy; license details therefore vary considerably across the States.

A level of security is normally applied to water licenses: this has traditionally been based on the purpose for which the license was originally issued. The accepted priority of water supplies (from highest to lowest) is: town supply, stock and domestic, perennial crops (e.g. vineyards and orchards), and annual crops (e.g. grains).

Most water licenses are specified in volumetric terms as an entitlement, based on a certain level of historical security of supply (exceeding availability in 99% of years in the case of Victoria). Volumetric measurement and charging for surface irrigation water have been the norm throughout most of the Murray Darling Basin since the 1960s and go back much longer in Victoria. The actual amount a license holder can obtain in one year is determined *pro rata* by the announced allocation, which is reviewed every month or so, based on different formulas that incorporate available storage plus minimum (1:100year) expected rainfall volume and minus the volume required by high priority uses. The precise formulation of the allocation and entitlement rules varies from State to State, particularly in relation to environmental reserve, environmental flow rules governing dam operations, and the ability to carry over unused allocated quantities from one year to the next.

To some extent, this "sharing" approach was the result of an explicit rejection of the "prior appropriation" doctrine practice by the western states of USA. It could nevertheless be contended that environmental and some native water title can claim priority at least partially by virtue of history. The capacity of a sharing approach to entirely avoid prior appropriation issues also rests heavily on sound definition and hydraulic understanding of the water resource being licensed, implicitly assuming these licensing frameworks account for any hydraulic connectivity between institutionally independent resources (e.g. surface water and groundwater).

In the Murray Darling Basin, interstate water shares were agreed in 1915 and those limits were not tested by water resources developments until it was recognized in the late 1970s that the licensed volume exceeded available resources, particularly in New South Wales (Tullar and Fullagar, 2005). Subsequently, it was estimated that at then current rates of irrigation expansion, the actual diversion would exceed sustainable limits by 2020 and possibly approximate the volume of annual runoff to the sea. Therefore, a Cap on diversions of surface water was agreed in 1995 (see also Section 3.2), set not to exceed the volume diverted at the extent of agricultural development in 1994. Each State was left with the responsibility to introduce its own mechanisms to implement the Cap, and the process is being audited independently every year since then. The idea of a rolling cap has been implemented *de facto*, which allows states to over-run the cap in low allocation years providing that they balance this in subsequent above average years. Since 2000, three to four years of consecutive drought, with less than the previous 1:100 year water availability, have put some strain on this arrangement. The largest volume of unused licenses is in New South Wales, due to the existence of "sleeper and dozer"[1] users and relatively conservative withdrawals by many farmers in response to the lower security of supply in NSW, where there is considerably less inter-annual storage volume than in Victoria.

Water trading has been activated through private, state and central initiatives since the mid 1980s, although temporary trading has a long and informal history. The liberalization of water trading since the mid 1990s has activated some of this unused volume, putting further strain on the security of supply to existing users. The market is dominated by temporary transfers of unused allocated quantities between seasons and activities, reflects the general drought cycle and water resources availability, while permanent trades accounting for less than 1% of licensed volume. Most water trade is between irrigators and within a particular state and interstate trading is currently limited by questions of exchange rate between upstream and downstream transfers.

[1] "Sleepers" and "dozers" are license holders who pay for their entitlement annually, but use little or none of it. Typically they are run mixed farms with rainfed crops and substantial livestock holdings, for which they keep water entitlements as insurance in drought years, either for fodder production or direct stock watering. There are no "use-it or lose-it" provisions (as in the US Prior Appropriation doctrine) for water licenses in Australia.

4. California

California is a state of contrasts and diversity. The range of annual rainfall varies greatly from more than 140 inches in the northwestern part of the state to less than 4 inches in the southeastern part. California is the third largest state in the USA, with more then 1,600 km from its northwest to southeast corners. Most of the state has a Mediterranean climate, with cool, rainy winters and dry summers. Current offshore often creates summer fog near the coast. Further inland, the climate is colder winters and hotter summers. The northern parts of the state average higher annual rainfall than the south. California's mountain ranges influence the climate as well: some of the rainiest parts of the state are west-facing mountain slopes. Northwestern California has a temperate climate and the Central Valley has a Mediterranean climate but with greater temperature extremes than the coast. The high mountains, including the Sierra Nevada, have a mountain climate with snow in winter and mild to moderate heat in summer. The east side of California's mountains has a drier rain shadow. The low deserts east of the southern California mountains have hot summers and nearly frostless mild winters; the higher elevation deserts of eastern California have hot summers and cold winters[1].

The two most important rivers within California are the Sacramento River and the San Joaquin River, which drain the Central Valley and flow to the Pacific Ocean through San Francisco Bay. Two other important rivers are the Klamath River, in the north, and the Colorado River, on the southeast border.

As flows make their way into the valleys, much of the water percolates into the ground. Groundwater and surface water are inextricably linked in the hydrologic cycle. The vast majority of California’s groundwater that is accessible in significant amounts is stored in alluvial groundwater basins, which cover nearly 40 percent of the geographic area of the state. Groundwater supplies contribute water used for beneficial purposes. Interbasin storage and transfer projects allow for redistribution of water (California Water Plan Update 2005).

California has a very large and diverse economy with a gross product of more than a trillion dollars (13,5 percent of the U.S. total). The economy is a mix of long-established industries such as agriculture and mineral extraction and emerging industries such as biotechnology, telecommunications, and computer technology.

California’s population increased from about 30 million in 1990 to about 36.5 million in 2004. The state is now growing by about 600.000 people per year. The California Department of Finance (DOF) projects that the population may exceed 48 million by 2030.

In average water years like 2000, California receives about 200 million acre-feet of water from precipitation and imports from Colorado, Oregon, and Mexico. Of this total supply, about 50 to 60% is either used by native vegetation, evaporates to the atmosphere, provides some of the water for agricultural crops and managed wetlands (effective precipitation), or flows to Oregon, Nevada, the Pacific Ocean, and salt sinks like saline groundwater aquifers and Salton Sea. The remaining 40 to 50 percent (denoted as dedicated supply) is distributed among urban and agricultural uses, used to protect and restore the environment, or stored in surface and. groundwater reservoirs for later use. Ultimately, about a third of the dedicated supply flows to the Pacific Ocean (in part to meet environmental requirements) or to other salt sinks. Statewide, local surface water and groundwater supplies make up

[1] http://en.wikipedia.org/wiki/ California#Climate

about 50 percent of California's total dedicated supply in an average water year (California Water Plan Update 2005).

Table 4: California water resources summary (million acre feet)

	1998 (171% of normal)[a]		2000 (97% of normal)[a]		2001 (72% of normal)[a]	
Total supply (precipitation & imports)	336.9		194.7		145.5	
Total uses, outflows, & evaporation	331.5		200.4		159.9	
Net storage changes in state	5.5		-5.7		-14.3	
Distribution of dedicated supply (includes reuse) to various applied water uses						
Urban uses	7.8	(8%)	8.9	(11%)	8.6	(13%)
Agricultural uses	27.3	(29%)	34.2	(41%)	33.7	(52%)
Environmental water[b]	59.4	(63%)	39.4	(48%)	22.5	(35%)
Total dedicated supply	**94.5**		**82.5**		**64.8**	

maf = million acre-feet
a. Percent of normal precipitation. Water year 1998 represents a wet year; 2000, average water year; 2001, drier water year.
b. Environmental water includes instream flows, wild and scenic flows, required Delta outflow, and managed wetlands water use. Some environmental water is reused by agricultural and urban water users.

Source: California Water Plan Update 2005

4.1 Governing water systems

The main administrations dealing with governance of water systems are two boards which are part of the **California Environmental Protection Agency** (Cal/EPA), i.e. (Cal/EPA, 2006):

- The State Water Resources Control Board (SWRCB),
- The Regional Water Quality Control Boards (RWQCBs)

The mission of the **State Water Resources Control Board** (SWRCB), created in 1967, is to ensure the highest reasonable quality for waters of the California State, while allocating those waters to achieve the optimum balance of beneficial uses. The joint authority of water allocation and water quality protection enables the Water Board to provide comprehensive protection for California's waters. The Water Board consists of five full-time salaried Members, each filling a different specialty position. Each board member is appointed to a four-year term by the Governor and confirmed by the Senate.

There are nine **Regional Water Quality Control Boards** (RWQCB). The mission of each Regional Boards is to develop and enforce water quality objectives and implementation plans that will best protect the beneficial uses of the State's waters, recognizing local differences in climate, topography, geology and hydrology. Each Regional Board has nine part-time Members also appointed by the Governor and confirmed by the Senate. Regional Boards develop "basin plans" for their hydrologic areas, govern requirements/issue waste discharge permits, take enforcement action against violators, and monitor water quality. The task of protecting and enforcing the many uses of water, including the needs of industry, agriculture, municipal districts, and the environment is an ongoing challenge for the Water Board and Regional Boards.

The water resource protection efforts of the State Water Resources Control Board and the Regional Water Quality Control Boards are guided by a five-year Strategic Plan. A key component of the Strategic Plan is a watershed management approach for water resource protection. This plan, called Watershed Management Initiative (WMI), implements water quality solutions by focusing limited resources on key uses, addressing point and non-point sources of pollution, integrating surface and ground water regulatory programs, and involving interested and affected parties in point and nonpoint pollution control.

Two other bodies are dealing with the administration of water systems:

- The **Department of Water Resource (DWR)**, which operates and maintains the State Water Project[1], including the California Aqueduct. The Department is also responsible for providingdam safety and flood control services, assisting local water districts in water management and conservation activities, promoting recreational opportunities, and planning for future statewide water needs.
- The **CALFED Bay-Delta Program**, which is a unique collaboration among 25 state and federal agencies that came together with a mission: to improve water supplies in California and the health of the San Francisco Bay/Sacramento-San Joaquin River Delta. The mission of the CALFED Bay-Delta Program is to develop and implement a long-term comprehensive plan that will restore ecological health and improve water management for beneficial uses of the Bay-Delta System.

Figure 3 presents the organisational chart for water resources management in the State of California.

[1] The California State Water Project is one of the world's largest publicly built and operated water and power development and conveyance system. The original purpose of the project was to provide water for arid Southern California which lacks adequate local water resources necessary for economic development. Today, the SWP provides drinking water for over 23 million people. Construction began in the late 1950s. Most of the water (roughly 80%) generated by the project is in fact used for agriculture, primarily in the San Joaquin Valley, as pumping the water over the Tehachapi Mountains is costly and Southern California has other sources of water such as the Owens River, tributary creeks to Mono Lake and the Colorado River (Wikipedia, 2006, http://en.wikipedia.org/wiki/California_State_Water_Project)

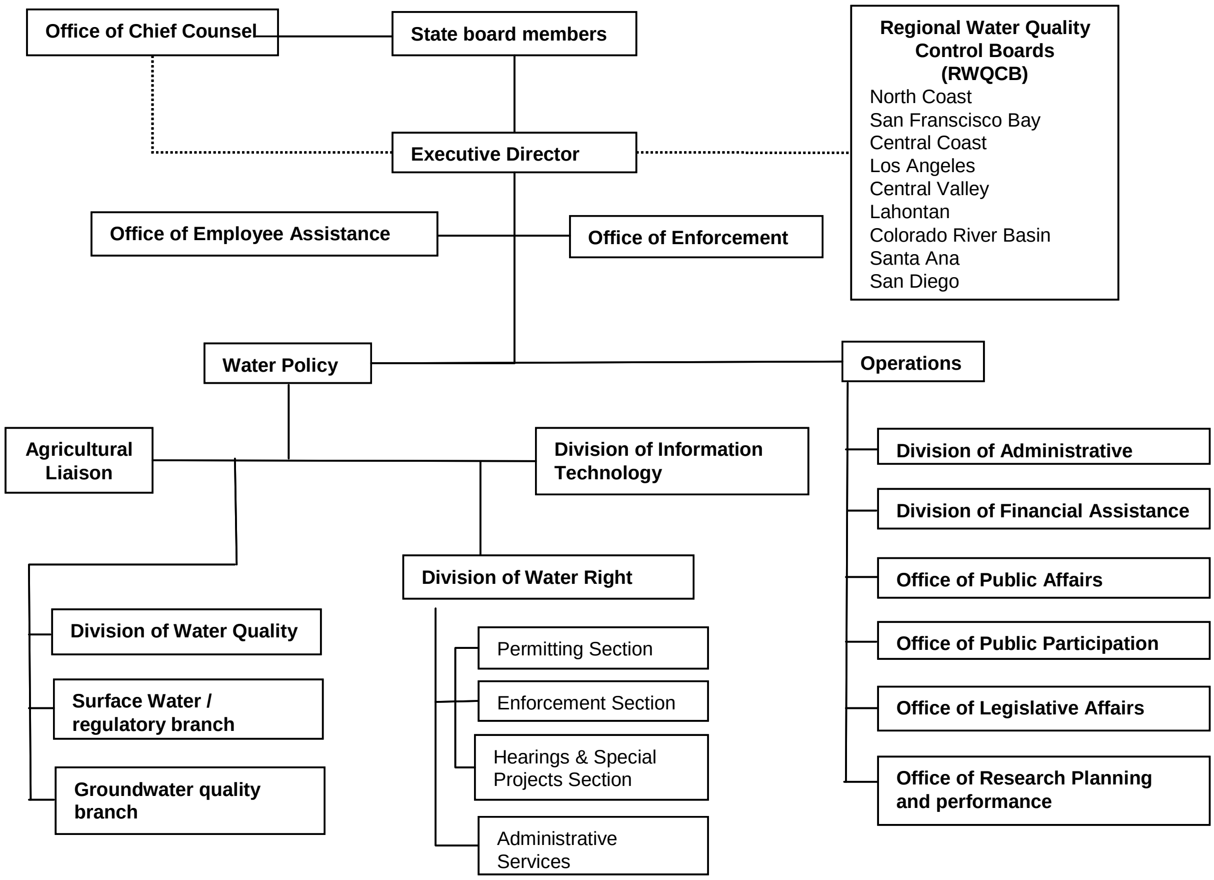

Figure 3: State Water Resources Control Board: organizational chart (California Environmental Protection Agency, 2006)

4.2 The public participation programme

The California Water Boards have created a new public participation programme to strengthen California State efforts at involving the public in the decision-making processes.

To build this program, the Water Boards prepared a "needs assessment" to evaluate California State current public involvement practices, and provide recommendations on how to improve upon California State work with the public.

Based on this needs assessment, the organization plans to prioritize and support the integration of new public participation strategies into project work and to ensure that efforts are standardized throughout the state. Currently, the Water Board is training staff on enhanced public participation processes and is developing a guidance manual to help staff use these new strategies and tools in their work. California State public affairs office will also be assisting staff in designing and implementing effective stakeholder involvement processes (California Environmental Agency, 2007).

This "needs assessment" report was prepared for the Water Boards by the Center for Collaborative Policy of California State University-Sacramento, in partnership with University of California. The report was published in April 2005. It was developed to assess the strengths and weaknesses of California State current public involvement practices, and to help the state in the development of additional tools to help staff design, conduct and integrate public involvement activities into regulatory and program work.

In May 2005, California Environmental Protection Agency (Cal/EPA) proposed recommendations for a public Participation policy based on the results of the "needs assessment" report.

The report declared that to enhance public participation efforts, California Environmental Protection Agency and its Boards, Departments and Offices (BDOs) will jointly develop and implement the following:

- Consistent and uniform public participation processes for all BDOs; a common complaint resolutions process, using the Air Resources Board's complaint resolution process as a model so similar matters are dealt with consistently across BDOs
- A consistent approach for all BDOs on the use of plain language
- Common guidelines (including translation), and a regional approach for public participation
- Training for public participation and principles of environmental justice
- Demographic and community assessment databases and continuous evaluation and updating of electronic public participation tools.

With reference to the **implementation of consistent and uniform public participation processes** for all BDOs, Cal/EPA BDOs will develop a process for dealing with concerns directly related to public participation. Members of the public shall have a point of contact to discuss their concerns about implementation of environmental justice and public participation policies. Air Resources Board complaint process; should serve as a model for discussion. The process shall include language specific to public participation and environmental justice.

The development of **a consistent approach for all BDOS on the use of plain language** aims to ensure that all BDOs take a "Plain Language" approach when communicating with the public. Cal/EPA BDOs shall develop a guidance document for use by staff and management. As part of a plain language effort, the guidance developed under this recommendation will be written in a way that allows the public to fully understand the regulatory processes of each BDO. This information will be made available to the public in a variety of formats (on the Cal/EPA Web site, and in printed materials). In addition, each BDO will be asked to develop its own guidance in plain language.

With reference to the need for developing **Common Guidelines** (Including Translation), and a **Regional Approach for Public Participation**, it should be noted that roughly a third of Cal/EPA community outreach is done in communities where there are significant numbers of non-English speaking residents. Currently, each BDO provides varying levels of translation. The following issues will be considered in developing a regional approach to public participation:

- Developing a strong regional identity for Cal/EPA and its BDOs.
- Holding community meetings to discuss environmental issues under the BDOs purview.
- Forming advisory groups, where appropriate, to disseminate information and assist the BDOs in gathering public input.
- Developing databases where environmental information can be easily retrieved via the Internet.
- Creating local and statewide hotlines for environmental compliance issues and complaints.
- Developing web pages accessible through Cal/EPA's Web site that will contain regional environmental publications, reports, and data.
- Creating common repositories for printed information created in response to local issues
  - Working with local governments

- Developing relationships with and a presence in rural communities

Training for public participation and principles of environmental justice will primarily be implemented through the establishment of a training matrix for public participation and environmental justice. Trainings will reflect the policies and guidance developed under these recommendations. Where feasible, Cal/EPA or its BDOs shall extend staff training opportunities to stakeholders, especially local governments who interact with the committee on similar or related issues. Community members and other members of the public will be asked to help present training elements to staff members when appropriate.

The recommendation for the **development of demographic and community assessment databases** targets the increase and improvement of communication with the public. Many communities are quite willing and able to use electronic tools to provide public comments, to answer survey information, to ask questions, and to conduct research. Teleconferencing and web casting technology have improved to the point where public meetings can be conducted on a state-wide basis. In developing a regional approach to public participation, these tools can allow for outreach and participation on a broad basis. The recommended electronic public participation tools include web casting, electronic comment forms, forums and website development.

With regard to future actions relating to public participation, the California State Water Resources Board is currently preparing:

- A legislative report that outlines action steps the Board is taking to implement recommendations from the needs assessment.
- A public participation guidance manual to provide staff with a desktop reference to design effective stakeholder involvement processes.

4.3 Valuing Water

4.3.1 Water markets

As further described in Section 4.4, California has a unique system of **surface water rights** that combines a traditional riparian system with the appropriative system found elsewhere. A compensated transfer system for water or water rights called **"water market"** had been developed. This transfer process involves a market transaction, in which water use or ownership rights are exchanged for money. This market enables the historical holders of water rights (mainly farmers in the agricultural heartland) to transfer water to other users willing to pay for it. Potential buyers include urban and industrial users, farmers with higher-value crops, and environmental programs to support fish and wildlife habitats. Spurred by drought in the late 1980s and early 1990s, the volumes traded in California's water market now account for roughly 3% of the state's water use (Public Policy Institute of California, 2003).

Agricultural water districts are the main suppliers, with Central Valley farmers typically accounting for three-fourths of all sales. In the San Joaquin Valley, where environmental mitigation programs have reduced water deliveries, farmers have turned to the market for replacement water. Their purchases account for over half of the water market's expansion since 1995. The state has also been a major player, running drought-year water banks and buying water for environmental programs. Direct purchases for instream uses and wildlife reserves account for over one-third of the market expansion. Municipal agencies are the major buyers of long-term and permanent contracts, which account for roughly 20% of all sales. Recent legislation requires that local governments demonstrate adequate water supplies for development, and this policy should increase urban demand for long-term water transfers.

California law protects surface water users, including fish and wildlife, from the effects of water transfers under the "no injury" statutes of the Water Code. Because groundwater is not regulated by the state, however, these protections do not extend to groundwater users. However, concerned about the effects of groundwater exports, several (22 of 58 in 2003) counties have adopted ordinances restricting such transfers. The ordinances require an environmental review before sellers receive a permit to export groundwater (or surface water that is replaced by additional groundwater pumping). It seems that the high costs of these reviews and the likelihood of negative public opinion often discourage potential sellers from seeking permits in the first place.

4.3.2 Environmental filing fee

Since 1991, **water right applicants** have been required to pay an environmental **filing fee** to the California Department of Fish and Game (CDFG) with each application. The 1991 memo introducing the fee states that *"these fees are not intended to reimburse costs specifically identifiable to individual projects, but rather to offset a relative portion of the cumulative effect of all projects"*.

4.4 Sharing water

The systems of **water rights** in use in California is a good example of a practice for sharing water. As mentioned above, California has a unique system of **surface water rights** that combines a traditional riparian system with the appropriative system found elsewhere. Under the Californian Constitution, water must be put to reasonable and beneficial use. No water right grants any party the right to waste or make unreasonable use of water, and any water right can be curtailed or revoked if it is determined that the holder of that right has engaged in a wasteful or unreasonable use of water. Secondly, no water user in the State "owns" any water. Instead, a water right grants the holder thereof only the right to use water (called a "usufructuary right"). The State has the power and the obligation to reallocate that water in accordance with the public's interest (Sawyers, 2005).

California's system for surface water rights recognizes both **riparian rights** and **appropriative rights**.

A **riparian right** is the right to divert, but not to store, a portion of the natural flow for use based on the ownership of property adjacent to a natural watercourse. Water claimed through a riparian right must be used on the riparian parcel. Such a right is generally attached to the riparian parcel of land except where a riparian right has been preserved for non-contiguous parcels when land is subdivided. Generally, riparian rights are not lost through non-use. All riparian water users have the same priority; senior and junior riparian water rights do not exist. During times of water shortage, all riparian water users must adjust their water use to allow equal sharing of the available water supply. Concerning **appropriative rights**, under the prior appropriation doctrine, a person may acquire a right to divert, store, and use water regardless of whether the land on which it is used is adjacent to a stream or within its watershed. The rule of priority between appropriators is "first in time is first in right." Acquisition of appropriative water rights is subject to the issuance of a permit. Appropriative rights may be sold or transferred.

Many "water rights" in California are not quantified, but are simply claimed and/or exercised without objection by other parties. However, when competing demands for a common water supply (surface water, groundwater or both) become too great, formal adjudications are sometimes commenced by one or more of the competing claimants. Both the SWRCB and the courts can conduct adjudications under appropriate circumstances, which typically result in an enforceable order allocating the water (and the water rights) in the adjudicated stream system, groundwater basin or combined water source. Adjudications typically take years (or even decades) to complete because of the often complex legal and factual issues involved. Frequently, the result of an adjudication is an equitable apportionment of water that does not "track" with a technical application of water law principles.

For **Groundwater Use and Management**, California does not have a state wide management program or permit system to regulate the extraction and appropriation of groundwater. Courts have recognized that ground water management is the responsibility of local agencies. **Tribal Water Right** is also an important issue. Some Indian reservations and other federal lands have reserved water rights implied from acts of the federal government, rather than state law. When tribal lands were reserved, their natural resources were also reserved for tribal use. Since reserved tribal rights were generally not created by State Law, the water allocations of the State did not account for tribal resources.

5. Canada

Canada occupies most of the northern portion of North America. It shares land borders with the contiguous United States to the south and with the US state of Alaska to the northwest, stretching from the Atlantic Ocean in the east to the Pacific Ocean in the west; to the north lies the Arctic Ocean. The population density of 3.5 people per km^2 is among the lowest in the world. The most densely populated part of the country is the Quebec City-Windsor Corridor along the Great Lakes and Saint Lawrence River in the southeast. To the north of this region is the broad Canadian Shield, an area of rock scoured clean by the last ice age, thinly soiled, rich in minerals, and dotted with lakes and rivers. Canada has by far more lakes than any other country in the world, and has a large amount of the world's freshwater.

Average winter and summer high temperatures across Canada vary depending on the location. Winters can be harsh in many regions of the country, particularly in the Prairie provinces, where daily average temperatures are near −15°C, but can drop below -40°C with severe wind chills. Coastal British Columbia is an exception and enjoys a temperate climate with a mild and rainy winters. On the east and west coast average high temperatures are generally in the low 20°C, while between the coasts the average summer high temperature range between 25°C to 30°C with occasional extreme heat in some interior locations exceeding 40°C[1].

Canada is composed of ten provinces and three territories. The provinces have a large degree of autonomy from the federal government, the territories somewhat less. The provinces are responsible for most of Canada's social programs and together collect more revenue than the federal government, an almost unique structure among federations in the world. Using its spending powers, the federal government can initiate national policies in provincial areas the provinces can opt out of these, but rarely do so in practice. Equalization payments are made by the federal government to ensure that reasonably uniform standards of services and taxation are kept between the richer and poorer provinces.

5.1 Governing water systems

5.1.1 The Role of the Federal Government

The Canadian Water Act precise that (Ministry of Justice of Canada, 2006): *"For the purpose of facilitating the formulation of policies and programs with respect to the water resources of Canada and to ensure the optimum use of those resources for the benefit of all Canadians, having regard to the distinctive geography of Canada and the character of water as a natural resource, the Minister may, with the approval of the Governor in Council, enter into an arrangement with one or more provincial governments to establish, on a national, provincial, regional, lake or river-basin basis, intergovernmental committees or other bodies, to*

- *a) maintain continuing consultation on water resource matters and to advise on priorities for research, planning, conservation, development and utilization relating thereto;*
- *b) advise on the formulation of water policies and programs; and*
- *c) facilitate the coordination and implementation of water policies and programs."*

[1] http://en.wikipedia.org/wiki/Canada

According to this Act, the Minister of environment *"may, with the approval of the Governor in Council, with respect to any waters where there is a significant national interest in the water resource management thereof, enter into agreements with one or more provincial governments having an interest in the water resource management of those waters, providing for programs to:*

d) establish and maintain an inventory of those waters,

e) collect, process and provide data on the quality, quantity, distribution and use of those waters,

f) conduct research in connection with any aspect of those waters or provide for the conduct of any such research by or in cooperation with any government, institution or person,

g) formulate comprehensive water resource management plans, including detailed estimates of the cost of implementation of those plans and of revenues and other benefits likely to be realized from the implementation thereof, based on an examination of the full range of reasonable alternatives and taking into account views expressed at public hearings and otherwise by persons likely to be affected by implementation of the plans,

h) design projects for the efficient conservation, development and utilization of those waters, and

i) implement any plans or projects referred to in paragraphs (d) and (e), and

j) establishing or naming joint commissions, boards or other bodies empowered to direct, supervise and coordinate those programs."

In fact, the Canadian federal government's role in protection and management of sources of local water supplies is very limited. The federal government has no direct role in regulating water abstractions off federal or aboriginal lands, largely as a result of the primacy of provincial jurisdiction over natural resources. Its most significant activities related to water resource management are focussed on research (Winfield, 2002).

The federal government could, under certain circumstances, employ its jurisdiction over navigable waters, fish habitat, or international waters to regulate water abstractions that might interfere with navigation, damage fish habitat, or remove waters from an international water body.

5.1.2 The Role of the Provincial Government – the example of Ontario

In most provinces, the responsibility for the protection of surface and ground waters from inappropriate or unsustainable uses and contamination is fragmented among numerous provincial and local agencies, with no agency provided with clear lead responsibility. In Ontario, the provincial Ministries that may have major role in the regulation or performance of activities that may affect water sources are presented in Table 5.

Table 5: Ontario provincial Ministries with major potential roles on IWRM

Ministry	Areas of responsibility
Environment	Water taking and industrial and municipal discharge to surface water
Natural Resource	Dams and other "improvements" to lakes and rivers (e.g. canals); forestry, approval pf gravel pits and quarries, construction of oils, gas and brine wells
Agriculture, Food and Rural Affairs	Farms and intensive livestock operations
Northern Development and Mines	Mineral exploration, mine operation, closure and remediation.
Transportation	Road and highway construction and maintenance
Municipal Affairs	Land-use planning and financing of municipal infrastructure.
Consumer and Business Services/Technical Standards and Safety Authority	Underground storage tanks for fuels and other materials.

The extent of the fragmentation of responsibility for source water protection has been a major focus of recent reports by the province's Environmental Commissioner and Provincial Auditor. Similar problems have been highlighted in British Columbia by that province's Auditor-General. In Ontario, these reviews have highlighted the lack of a central record-keeping system regarding permits to abstract water and the failure to establish mechanisms to assess the cumulative effects of abstractions on the sustainability of water resources. The lack of monitoring and reporting requirements for abstractions and the absence of an overall strategy to protect groundwater sources from such abstractions, which are occasionally "inappropriate" in key recharge areas, have also been emphasized.

In Ontario, the role of municipal governments in water resource management is limited. The province has provided very limited policy direction to municipalities on the protection of surface and groundwater sources. The most important actors at the local level with respect to water resources are the **Conservation Authorities**, first established in the 1940's and of which 38 currently exist across the province. Conservation Authorities are local, watershed management agencies that deliver services and programs that protect and manage water and other natural resources in partnership with government, landowners and other organizations (Conservation Ontario, 2006). Theses Authorities are set up on a watershed basis, and are operated on a cooperative basis by local municipalities within the watershed. Their initial role focused on flood control, although their activities have widened to included broader watershed and ecosystem management functions. This has included the protection of sensitive ground water recharge/discharge areas, aquifers and headwaters though land purchases, restoration activities, efforts to reduce non-point source pollution, particularly from agricultural sources (Winfield, 2002).

5.1.3 Public participation principles

Public participation in environmental assessments has been a regular practice for many years in Canada. Some provinces provide funding for citizens making legal interventions on issues of public concern. However, this was discontinued in the late 1990s in some provinces (e.g. Ontario), as part of a general drive for environmental deregulation. The new Canada Environment Protection Acts confirms the right of citizens to take issues of concern to Environment Canada and request investigation. The Commission for Environmental Cooperation[1], has the responsibility to receive, investigate and report on submissions from citizens about environmental concerns (UNEP, 2000).

Conservation Districts in Canada are based on the partnership of local communities, landowners, NGOs, industry and government. The most successful and innovative of these organizations, such as Manitoba's Conservation Districts, receive baseline support from the provincial government. The Districts are governed by a board of local people who decide about priority actions on a broad range of natural resource management issues, from water and soil conservation to public education and outreach. Combining modest but stable funding from government with a clear institutional structure, long-term thinking, a mandate for conservation and local participation seems to be a successful model for other regions.

5.2 Valuing Water

Canada is one of the developed countries with the lowest commercial water rates according to the latest National Utility Services International Price Survey (Figure 4).

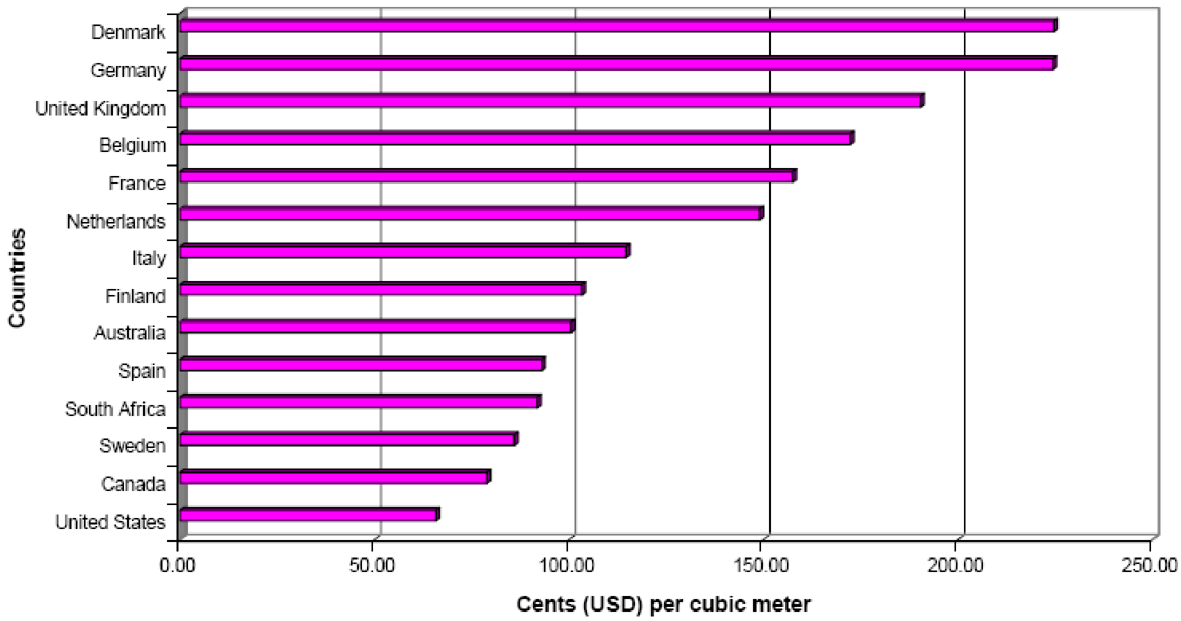

Figure 4: International Water Cost Comparison (NUS Consulting, 2006)

Several studies show that water revenues are not sufficient to cover operational, repair, upgrading, or expansion costs. They cover only a small part of the costs of supplying water. For example, irrigation water charges recover only about 10% of the development cost of the resource. The cost of maintaining (repairing and upgrading) municipal water supply and sewerage systems is estimated at \$23 billion over the next 10 years. The fact that this amount is not currently available is further evidence that water revenues do not meet costs (Environment Canada, 2006).

[1] The Commission for Environmental Cooperation (CEC) is an international organization created by Canada, Mexico and the United States under the North American Agreement on Environmental Cooperation (NAAEC). The CEC was established to address regional environmental concerns, help prevent potential trade and environmental conflicts, and to promote the effective enforcement of environmental law. The Agreement complements the environmental provisions of the North American Free Trade Agreement (NAFTA).

Water prices in Canada are set by provincial and municipal officials. Most provinces levy licence fees to major water users for access to the resource. The provincial licence fees for water are not set in accordance with any pricing principles, but rather are related to the cost of administering the licensing program.

Municipalities also levy charges to water users. In many areas, users are charged a flat monthly, quarterly, or annual rate in exchange for access to unlimited amounts of treated water. In other places, the charges are based on the volume of water used, as measured by a water meter. Irrigation water fees are paid according to the area irrigated, and not the volume of water used.

In the future, it is expected that the price of water will increase, to bridge the gap between the cost of providing water to the user and the revenue received from those using it.

5.3 Sharing water

In Canadian law, riparian rights may be classified under six categories: (a) the right of access to the water, (b) the right of drainage, (c) the rights relating to the flow of water, (d) the right to undiminished quality of water (pollution), (e) the right to use of water, and (f) the right of accretion.

The **Right of Access** refers to the basic right of a riparian owner to have access to the adjoining water. Without access to the water, a riparian owner could not enjoy the other rights. The right includes access both to and from the water. On tidal waters, this involves the right to go on the shore. On non-tidal rivers or lakes, this involves a right of access over the shallow waters to deeper waters where navigation can practically begin. The right of access extends across the entire length of a riparian owner's land fronting the body of water. A riparian owner would lose a right of access where the land is required for a public work on a portion of the shore located in front of the riparian owner's land. The riparian owner's right of access to waters must be distinguished from the public's right of navigation on the water and the public's right to fish. Navigation on a body of water may legally interfere with a riparian owner's right of access to some extent. The exercise of the right of fishing, may temporarily obstruct access to some degree but the right of access cannot be blocked by permanent fishing installations (Public Works and Government Services of Canada, 2006).

The **Right of Drainage** refers to the right of owners of land adjoining a natural stream to have the right to drain their lands in the stream. Draining lands may increase the flow of water which could have an adverse impact on lands further downstream. So an upper riparian landowner may be held liable for damages to a lower riparian owner's lands. This could occur where an increased flow of water causes damage to the lower lands which is attributable to drainage of lands outside the natural watercourse.

A riparian owner is entitled to certain rights **(Rights relating to Flow)** respecting the manner in which water reaches and leaves the land. An owner is entitled to permit water to flow through the lands as it has been accustomed to flow, substantially undiminished in quantity and quality. A riparian owner is also entitled to have water leave the land unobstructed. There are some underlying rights which have evolved through practical considerations and court decisions. These rights include:

- *The right to have water flow in its natural course:* A riparian owner may alter the course of the stream so long as it is returned to its normal channel without affecting the flow downstream.
- *The right to prevent the permanent extraction of water from the stream:* If water is diverted from a stream, it must be returned to the stream substantially undiminished in quality and

quantity. Accordingly, water diverted for the purpose of irrigation must be used without sensibly diminishing the flow of water downstream.

- *The right to prevent the alteration of the rate of flow to downstream property:* While a total flow of water downstream might not be affected over a specific period; an upstream owner could potentially alter the times when the water will flow, by increasing or decreasing its rate. This might be required for replenishing a reservoir for an irrigation project, or a head pond for a hydro-electric facility. A riparian owner is entitled to a reasonable use of water in a stream or on adjoining land which of necessity, affects the flow downstream. Whether a use is reasonable requires consideration of all the circumstances including the size of the stream, the season of the year, the nature of the use and the operations involved.
- *The right to have water leave land in its accustomed manner:* A riparian owner has the right to have water leave the land unobstructed. For example an upstream owner could face obstruction because of a dams built downstream. It can result in a flooding of upstream lands. So any person who interferes with the course of a stream must ensure that the works substituted for the natural channel can adequately carry the water brought downstream.

The **Right to Undiminished Quality of Water (Pollution)** refers to the right a riparian owner has to the flow of water **in its natural state.** An owner is not permitted to collect and discharge contaminants into the stream to the detriment of downstream riparian owners.

The **right to the use of water** refers to the right a riparian owner has to use water as it passes through the lands, although he does not own the water running in a stream. Water cannot be granted, but access easements can be granted by land owners for its use. Riparian rights of use differ between ordinary and extraordinary uses. The use of water for drinking purposes, watering stock and other domestic purposes are categorised as "ordinary uses". The use must be closely related to the adjoining land. Should an owner exhaust the water supply through ordinary uses, there is no liability for damages to a downstream riparian owner. Further, water from a stream that is used to supply properties that do not adjoin the stream would be considered extraordinary. A riparian owner may make use of water for extraordinary purposes so long as it is incidental to the use of the lands. What amounts to an extraordinary purpose will depend on the general conditions in the area and other uses of the stream. A common example is the use of water for running a mill. Unlike a person who uses water for ordinary purposes, one who uses water for extraordinary purposes, must restore it to the stream substantially undiminished in quantity and quality. There is no right of first appropriation. A riparian owner has no first right of use of the water for extraordinary purposes over downstream riparian owners.

The riparian owner is entitled to land created by accretion (**Right of Accretion**). Accretion is defined as the gradual and imperceptible increase in an area of land by natural causes e.g., by alluvial deposits resulting from movements of a river course or of the sea. There are two types of accretion. One is created by the gradual and imperceptible deposit of alluvium on the banks of a riparian owner's land. The other, results from the gradual and imperceptible recession of the waters to a lower level. In either case the additional dry land normally belongs to the riparian owner. On tidal waters, a riparian owner's right to accreted land occurs only where the lands accreted are above the high water mark. In practice, distinctions have been made between accretions which result from natural causes and those which result from man-made structures. An accreted portion of land which results from the action of water on man-made structures such as wharves, dikes, or breakwaters may not belong to a riparian owner. Riparian owners have the right to protect their property from invasion of water from the shore. The owners may take steps such as building a bulwark, dike or berm on their side of the water's edge to protect the lands from being washed away.

6. Chile

Chile is a middle-income country of 15 million inhabitants, of which 6 million live in Santiago (Davis, 2004).

Chile is a long and narrow coastal Southern Cone country on the west side of the Andes Mountains. The country stretches over 4,630 km north to south, but only 430 km at its widest point east to west (Average value only 117 km from east to west). This induces a very important variety of landscapes. The northern Atacama desert contains great mineral wealth, primarily copper and nitrates. The relatively small Central Valley, which includes Santiago, dominates the country in terms of population and agricultural resources. This area also is the historical center from which Chile expanded in the late 19th century, when it integrated the northern and southern regions. Southern Chile is rich in forests, grazing lands, and features a string of volcanoes and lakes. The southern coast is a labyrinth of fjords, inlets, canals, twisting peninsulas, and islands. The Andes Mountains are located on the eastern border source[1].

Watersheds are relatively small, with steep, short rivers that run from east to west. Water resource availability varies substantially by longitudinal location, with arid and semi-arid condition in the north and center of the country, the principal areas of population and economic activity. Due to the physical configuration and size of watersheds, as well of human activities, relatively few water users exist in each watershed. Moreover, Chile shares few watersheds with neighboring countries (Davis, 2004).

During the military ruled government (1973-1990), a neo-liberal socioeconomic model was established, based on free market principles and export-oriented growth, largely based on export of primary product: mining, agriculture, forestry and fish. The government assumed a secondary role in many aspects of the economy. Water and environmental goods were treated largely as economics commodities. With transition to democracy, additional attention has been afforded to environmental protection and social concern. Consequently, over the past 30 years increased pressure has been exerted on water resources, including increased extraction, water quality degradation, and growing conflicts among water users.

6.1 Governing water systems

With regard to water resources management, the State is responsible for:

- Measuring and determining the availability of water resources, and generating/updating the necessary databases that can allow for a well-informed management of water resources;
- Regulating the use of water resources, while avoiding third party effects (impacts) and their overexploitation. For that purpose the State must analyze the availability of water resources and potential conflicts in water use, before granting new water use rights and other authorizations such as changes in water distribution infrastructure; and
- Conserving and protecting water resources, through the environmental impact assessment of the system and environmental policies.

The **Dirección General de Aguas - DGA (National Water Directorate)** which operates under the Ministry of Public Works is responsible for (Davis, 2004):

[1] http://en.wikipedia.org/wiki/Chile

- Delivering initial water rights;
- Maintaining the records related to water rights;
- Collecting and disseminating quantitative and qualitative information on water resources;
- Performing general water resources planning;
- Reviewing technical aspects of hydraulic projects.

At the present, the DGA comprises a Headquarter, a Subdivision and 6 Departments, the Hydrology, Legal, Conservation and Protection of Hydric Resources, the Administration of Water Resources, the Studies and Planning and the Administration and General Secretariat Departments. The DGA has 13 Regional Directions and 6 Provincial Offices in the cities of Iquique, Illapel, Ovalle, Chillán, Los Angeles and Valdivia.

Other actors with a role in water management are:

- The **Superintendency of Sanitary Services**, which monitors the privatized or autonomous water and sanitary services providers, and assists in the documentation on water quality and emissions, and legislation enforcement.
- The **Ministry of Energy,** which retains limited regulatory functions in private hydropower generation.
- The **Hydraulic Work Directorate** (DOH), which designs and constructs hydraulic projects, including reservoirs for agricultural water supply and flood protection works. It operates few reservoirs and undertakes outreach programs.
- The **National Environmental Commission** (CONAMA), which oversees the implementation of environmental regulations (including water quality) and the system of environmental assessment (review of certain hydraulic works).

The **private sector** is responsible for the (Donoso, 2006):

- Assessment, financing, and implementation of development projects associated with water. In this process, water use rights represent commercial assets and water is considered to be a productive input, and
- Distribution of water and its proper use by the members of user organizations, as well as for the construction, maintenance and management of irrigation structures. Three different types of such organizations are foreseen in the Water Code: boards of control, canal-users' associations, and water communities.

The privatisation of Chilean water companies is cited as an example of good practice by the World Bank (Bitran and Valenzuela, 2003). In 1998, the State started to privatize the 13 state-owned regional water companies. Privatization was carried out through concessions and full divestitures of assets. British, French, and Spanish consortia that bought the privatized companies brought with them not only technology but also the massive capital needed to carry out the new investments. Privatization was followed by the renewal of infrastructure by the privatized companies but also by the more apparent limitations for the public counterparts. While private companies invested 70% more in 2001 than in 1998, public companies invested almost 70% less. The public water sector decline reflected the growing difficulties of the Government in funding cash flows. Sharp differences between the two groups of companies also emerged in the setting of water prices. During the period 1998–2001, the rates set by private companies rose on average 20% more than those set by public utilities. This was mostly due to the higher investments by private companies, investments which also addressed the addition of new services, such as wastewater treatment.

According to the World Bank, this rise in water rates has taken a toll on consumption, which declined steadily since the new methodology for setting rates was introduced. Increasingly aware of the cost of water, customers reduced their consumption by almost 10% in only three years. The reduction in consumption resulted in evident benefits in the utilization of installed capacity, but was not a direct effect of privatization. The reduction of consumption is however linked to private sector involvement, since the adjustment of water rates was a precondition for private investment.

Another interesting fact is related to the comparison of labour productivity. While public companies reduced their workforce by a mere 5% in 1998–2001, private ones slashed their staff numbers by more than 30%, even while expanding their client base by more than 6 percent.

The World Bank concludes that private equity appears to provide a powerful boost in meeting the investment needs of a highly capital-intensive sector such as water and sanitation. The investment gap between the private and state-owned companies has become so evident that the remaining companies will probably be privatized in the long term. Not least among the reasons will be the smaller aggregate size of the state-owned companies, which will make it difficult for them to exert the necessary pressure within the Government for the approval of their capital requirements.

The World Bank also notes that surprisingly, in Chile a social consensus has emerged that rendered the higher water rates acceptable, given the improvements in service quality and the addition of new services, such as sewage treatment. However, a similar consensus may not arise in countries where cultural and social acceptance for the privatisation of public services is less. It should be noted that the water utilities of Chile that were privatized were already among the most efficient water and sanitation utilities in Latin America (including public and private companies).

6.2 Valuing Water

An important part of the 1980s water legislation reform was a new methodology for the definition of tariffs, which aimed at raising water prices to meet the true economic cost of the service. It seems that before this reform, water tariffs covered less than 50% of this cost and only 20% in regions where production costs were high.

As a result of these large rate increases, a new mechanism was required to protect the economically vulnerable households. Since the connection to the public network is almost universal in the urban areas of Chile urban areas, the affordability of consumption charges was the main issue, and a consumption subsidy was a solution. Chile chose a means-tested subsidy, targeted to individual customers rather than a traditional geographic or universal subsidy. The subsidy program, introduced in the early 1990s, relies on the water companies to deliver the service. The government reimburses them for the subsidies on the basis of the actual amount of water consumed by each beneficiary rather than a pre-established amount. With the most important water companies having been privatized since 1998, private companies now serve 73% of urban clients. Therefore, the subsidy scheme is essentially being implemented by private companies on behalf of the Government (Gómez-Lobo, 2004). By law, the subsidy can cover 25–85% of a household’s water and sewerage bill for up to 20 m^3/month (however, the currently applied limit is equal to 15 m^3/month), with the client paying the remainder. All consumption above the limit is charged at the full tariff. Each year the Ministry of Planning

(Mideplan) determines, for each region, how many subsidies are to be granted and how they are to be applied, following several general principles:

- The subsidy is based on the willingness-to-pay for water services among low-income households.
- Only households that would be unable to purchase what is considered to be a subsistence level of consumption should benefit.
- The subsidy should cover only the shortfall between actual charges and willingness-to-pay (no household should pay more than 5% of its monthly income for water and sewerage charges).
- The subsidy scheme is funded entirely from the budget of the central Government.

To obtain a subsidy, a household must apply to its municipality, which determines its eligibility mainly on the basis of a scoring system called CAS[1]. Another important criterion is that households must not have outstanding payments with the service provider.

The municipality must award subsidies in the order of the applicants' CAS scores. Subsidies are normally renewed yearly for up to three years before a household must reapply. However, if a municipality has distributed all the subsidies assigned to it and a new applicant has a lower CAS score than the last beneficiary, the municipality must withdraw the benefit from this last beneficiary and assign it to the more deserving applicant. The financial control and procedure for the subsidy scheme is described in Figure 5.

[1] The eligibility scoring system called CAS is the main targeting instrument used in Chile for distributing means-tested subsidies. It produces a score for each household wishing to be evaluated based on a personal interview at its dwelling. The questionnaire used includes 50 questions on general information, identification of household members, living conditions, crowding conditions, health conditions, comfort, occupation and income, ownership of durable goods, and other socioeconomic indicators. Once the interview is conducted and the CAS score calculated, the score is valid for two years, and the household can use it to apply for many different subsidies. Besides the water subsidy, eligibility for pension payments, family subsidy, free health benefits, and other subsidies is determined on the basis of the CAS score. Many municipalities outsource the interviews to private survey companies, but still calculate the CAS score. That lowers the risk of collusion between interviewers and households, since interviewers do not know the exact relationship between the households' answers and their CAS score.

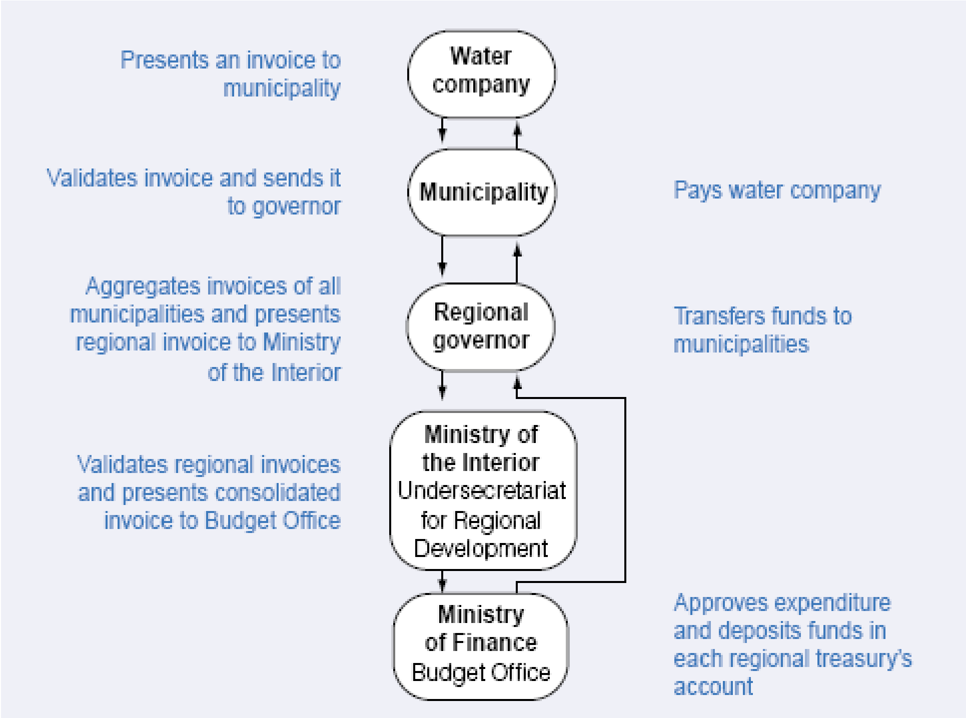

Figure 5: Financial control and procedure for the subsidy scheme (Gómez-Lobo, 2004)

6.3 Sharing water

The Water Code of 1981 established permanent and tradable water use rights with the objective of achieving an efficient allocation of water resources.

The current legislation establishes complete and permanent freedom in the use of water to everyone that has rights, with individuals permitted to use the water for whatever purposes and in whatever manner they wish. It is not necessary, in requesting rights, that one in any way justifies future use, and after a water rights transfer the continuation of the previous type of use of water is not required. Individuals can freely make changes in use, e.g. from irrigation to human consumption. The only limitation relates to the quantity of water that may be extracted from natural resources (Donoso, 2006).

There are currently two types of water rights: those that are entered in the relevant Real Estate Registries, and other, equally valid ones, which are not registered in the corresponding Real Estate Registries. The not-registered rights are largely the result of the fact that the current Code declared valid:

- Rights of use recognized by executive rulings, as of the date of their promulgation;
- Rights arising from grants given by competent authority, provided that they are currently being used and exercised, and
- Rights acquired by prescription.

It also provided that the exercise of rights of use recognized or constituted under previous laws shall be governed by their rules, and grandfathered any pre-existing formally registered rights already on record.

The procedure for acquiring a water use right begins with an application that must be completed and that meets the following requirements:

- Identification of the source from which the water is to be captured, specifying whether the water is surface or ground water;
- Indication of the quantity of water to be extracted, expressed in liters per second;
- Specification of the points at which the water is to be captured and the method of extraction;
- Indication of whether the right is consumptive or non-consumptive, permanent or contingent, continuous, discontinuous or alternating.

If there is competition for the water rights, they are to be allocated through a bidding process (auction) with an award to the user who offers the highest bid. However, in cases in which there is a societal interest in allocating the available water to a user who did not offer the highest bid, the **President of the Republic**, and he alone, may order that the auction be voided and may allocate the water to one of the other bidders. In order to establish original use rights, a prior application is not always required. The Director-General of Water is empowered, on his own initiative, to offer available flows at auction (Donoso, 2006).

In case of conflicts, the Water Code provides that conflicts occurring among users and between users and the organization shall be considered and resolved by the Board of the user association, acting as arbitrator, and the police may be employed to help enforce its decisions. More specifically, the Board, in its capacity as arbitrator, considers the following issues:

- Water allocation;
- Exercise of the rights that comuneros have as members of the community;
- Conflicts that arise regarding any of the previously mentioned points between comuneros and the community.

Some aspects of lack of IWRM due to the way this tradable water rights are used in Chile could be discussed (Davis, 2004):

- **Economic and water use inefficiencies:** No justification or charge occurs for solicitation of the initial water right. As a result, there are cases of hoarding, speculating, and hedging of the water right. Consequently, in many watersheds, the full complement of water is not serving its highest economic use. Potentially one could invest in water use efficiency and sell extra water right but, in fact, this is not usual. It is more usual to increase water use efficiency to produce more on one's property.
- **Externalities and conflicts:** Private water rights are not subject to formal regulatory review. Water right trades can impact water quality and quantity and result to adverse impacts on other water users. Moreover, existing water rights do not address water quality. Water quality issues are being addressed through a parallel program.
- **Stakeholder and public participation:** Many stakeholders or end-users are not present when debating water policies or in the Organization of Water Users. Indigenous and peasant farmer groups have been historically underrepresented. Environmental interests are also not directly represented, as well as other stakeholders with an interest in public good items (e.g. aesthetic and recreation issues associated with rivers and flow regimes).

7. Israel

Israel is characterized by a semi-arid Mediterranean climate, with dry and relatively long summers. Occasional drought took place between 1998 and 2000. Evaporation is important, representing an annual loss of approximately 150 million m^3/yr. The southern part of the country is characterized as semi-arid and quasi desert in some areas. Precipitation is abundant in the northern areas, where land resources are rather limited; on the other hand, the south is characterised by low rainfall levels and relative abundance of land. The average number of rainy days in Eilat (the southern tip of the country), is less than 5; the annual precipitation in the same area is approximately 42 mm.

Two thirds of resources are concentrated in the north of the country. Approximately two thirds of industrial and urban needs occur in the central part, whereas two thirds of agricultural demand occurs in the South. The monthly variation of available resources imposes a flexible management through the installation of sites of storage; in fact, the coastal water table operates as a natural reservoir.

The yearly consumption of water in Israel is estimated at 2 billion m^3/yr. The annual water deficit is evaluated between 250 and 317 million m^3/yr, and the quantity of not naturally renewed water amounts to 400 million m^3/yr. The cumulative deficit is between 4 and 6 billion m^3.

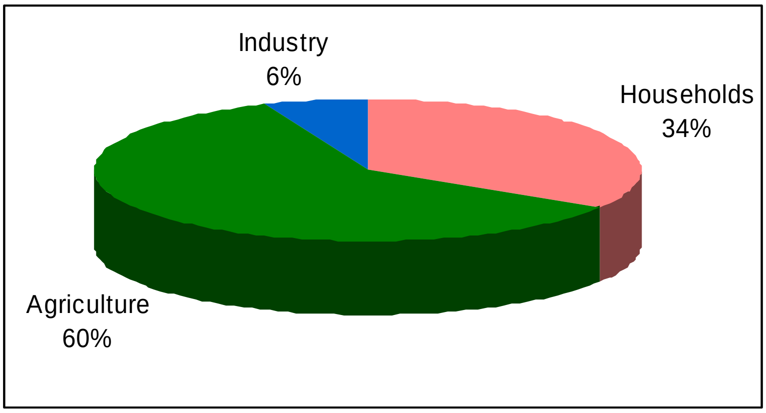

Figure 6: Distribution of consumption by use

Until 1975, water resources proved sufficient to meet all water needs. Since then, Israel had to face an increasing deficit, especially in the years 1984-1985. In 1987, the policy of subsidy of water for agricultural purposes was revised, involving, among others, the introduction of progressive consumer prices in irrigation water. Moreover, the strong 1999 drought exerted considerable pressure on water reserves, with water consumption being notably higher than the quantity of renewable water. Although the winter 2002-2003 was relatively rainy, the situation is still very alarming.

Water pollution has gradually become a real concern, and poses a threat as severe as water scarcity. The recent degradation of water quality is a focal problem, resulting in increases in salinity and nitrates concentration, and high concentration of organic and microbiological compounds in some areas. At present, pollution from heavy metals' discharges is less alarming. The deterioration of water quality is the result of two principal phenomena: agricultural development (use of manure and pesticides, decomposition of plants) and overexploitation of resources (sea water intrusion in coastal water tables).

Water shortage in the southern, semi-arid region of Israel required the construction of an extensive water-delivery system that supplies water from the northern part of the country (Figure 7). Thus, most of the country's fresh water resources were inter-connected into the **National Water Carrier**, commissioned in 1964.

Figure 7: Israel water infrastructure (Source: http://www.mfa.gov.il/mfa/)

The National Water Carrier supplies a total of 1,000 major consumers, including 18 municipalities and 80 local authorities. Its main function is to convey water to the southern region of the country from the Sea of Galilee (Lake Kinneret) in the north. Originally, the intention was to draw water from Jordan River, before it enters Lake Kinneret. The Carrier is a combination of underground pipelines, open canals, interim reservoirs and tunnels, supplying about 400 million m^3 per year from Lake Kinneret, located some 220 m below sea level. Water is pumped to an elevation of about 152 m above sea level, and flows by gravitation to the coastal region, whence it is pumped to the Negev area. In addition to the Sea of Galilee, two large aquifers, the Mountain Aquifer and the Coastal Aquifer, respectively contribute some 350 million m^3 and 250 million m^3 per year to the Carrier. The National Water Carrier functions not only as the main supplier of water, but also as an outlet for surplus water from the north in winter and early spring and a source of recharge to the underground aquifers in the coastal region. Most of the regional water systems are incorporated into the National Water Carrier to form a well-balanced network in which water can be shifted from one line to another according to conditions and needs.

Management of water in Israel, as advocated in the national legislation, is based upon the following principles (Israeli Government Web Site, 2006):

- Water resources are public property and there is no private ownership of water;
- Every person has the right to be allocated a certain water volume **for recognized purposes**;
- Water is scarce, available quantities are limited, and a prioritization process has to take place in order to ensure the supply of water of sufficient quantity and quality to all users;
- Only a centralized allocation of water resources can ensure the optimal use of the limited water resources;
- The consumers, through their representatives, need to have a major input in the formation of the rules relating to the allocation of water quotas;
- Attempts must be made to increase the quantities of water available for utilization by the consumers;
- The government has the right to take appropriate action to prevent the pollution of water resources.

7.1 Governing water systems

7.1.1 The Water Commission

The governance of water systems is the mission of the Water Commissioner, who is responsible for the overall management of Israeli water resources with the aim of ensuring a steady water supply to all citizens over time and for diverse uses (domestic, industrial and agricultural use). In more detail, the Water Commissioner is responsible for (a) formulating the water policy, (b) the planning and development of the water economy, (c) preventing the pollution of water sources, (d) the regulation of streams and flood prevention, (e) the utilization of overflow water, (f) the development of new water sources, (g) the utilization of wastewater, and (h) the development and promotion of efficient water use. As a civil servant, the Water Commissioner implements the policy of the Minister of National Infrastructure, is responsible in effect and by law for everything that occurs and is being conducted in the water economy, and represents the supreme government statutory authority, which is vested with the responsibility and powers of decision concerning the nation's water economy policy.

The Water Commission several departments/divisions, the Hydrological Service, the Demand Management Division, the Development Division, the Planning Division, the Drainage Division, the Division for the promotion of water saving, the Division for support and levy collection, the Water Quality Division, the scientific division, the Economic Department, the Legal Bureau and the Administrative and Operational Division. Their functions are further described in the following paragraphs.

The **Hydrological Service** deals with the establishment establishing hydrological background data for the operation of water sources and planning. Data are used as a basis for water production, abstraction licensing, supervision of operations required for maintaining the quality and quantity of water, and the preparation of water recharging and pumping operations. The service deals also with the initiation of hydrological research works, regular measurements of the water table the water level of the Kinneret Lake and of surface water bodies, in order to determine the water potential.

The **Demand Management Division** is charged with the implementation of the Water Law with respect to water production, supply and recharging rights. The division exercises the Water Commission's powers which concern the licensing, drilling and production of water, registration of water rights, allocation of water, and reporting on production, supply and consumption. The division works together with the Planning Authority of the Ministry of Agriculture and the districts for the verification of demands.

The **Development Division** manages all the staff work related to the implementation of the water economy development programs according to the programmes for the development of water works. It coordinates the development program with the various government offices: the Ministry of Defense, the Ministry of Housing, municipalities, settlements and the Jewish Agency. The division operates an engineering and economic control mechanism as well as supervision of water works execution by Mekorot (water company) in the framework of cost arrangements, and by other water suppliers.

The **Planning Division** is in charge of the long-term strategic planning of the water economy on all levels. The division is responsible for the consolidation of the water economy's long-term development plans, and the drawing up five-year plans. It also deals with the management of special water economy programmes in cooperation with other bodies (e.g. the National Contour Plan for Water, plans for the rehabilitation of rivers etc.).

The **Drainage Division**, which acts through regional authorities, is responsible for planning drainage projects, ordering the execution of a master plan for drainage, supervising and controlling the implementation of projects and for authorization of annual work programs of the drainage authorities.

The **Division for Water Saving** deals with water saving in the private and public sectors, the intiation and promotion of activities aiming at standardization and enforcement, the promotion of local and national projects on efficient water usage, water shortage and expanding the up-to-date technological solutions. The ongoing activities of the division's staff also include advice to planners, engineers and manufacturers.

The **Division for support and levy collection** deals with the fund's obligations and rights, the amount of the extraction levies, accompanies the continuing support for private water extractors, accompanies and follows up on the granting of allowances for the encouragement of projects for the restoration of streams and the improvement of wells.

The **Water Quality Division** deals with safeguarding the quality of water sources and operating a monitoring and data collection system for the promotion of programmes for the treatment and reuse of waste water through the coordination of disposal methods and preservation of the environment. The monitoring system is coordinated together with the Ministry of Environment and the Ministry of Health. Additionally, the division is responsible for programmes regarding the treatment and use of waste water in agriculture.

The **Scientific Division** serves as a forum for professional deliberations by all branches of research of the academic and research institutes. The latter convene from time to time for discussions, where an opportunity is given to scientists to participate and express their views on the activities and water at the national level (such as: sewerage, desalination, filtering policies, etc.)

The **Economic Department** is responsible for the preparation of proposals for changes in water prices through levies, grants and duties, control of Mekorot's water supply accounts, and the economic monitoring of the water economy development programs.

The **Legal Bureau** is in charge of initiating and handling primary and secondary legislation, consultation with regard to the implementation of the water laws, drawing up of contracts and agreements, coordinating the activities of the Water Council and the Objections Committee and representing the Water Commission before the various Knesset committees.

The **Administrative and Organisation unit** is in charge of operating the Water Commission in the domain of administration and organization, within the framework of the existing policy and directives.

7.1.2 The Lake Kinneret Authority

The area of Lake Kinneret is 170 km^2, but it collects water from a basin of 2,730 km^2 most of which falls within the boundaries of the State of Israel. The Lake Kinneret Authority is a regional and state body established to manage this watershed.

The Kinneret Administration operates within the framework of the Kinneret Authority. The Kinneret Administration is in charge of pollution prevention in the Kinneret drainage basin, for the shores of the Kinneret Lake, and for the supervision, control and monitoring within the basin's area. In addition, the administration provides regional services related to the disposal of sewage and waste, which is run as a “closed economy” independently of the centralised system.

7.1.3 The Mekorot Water Company Ltd.

The **Mekorot Water Company Ltd.** is a Government-owned company and, as the Israel's national water company, is responsible for managing the country's water resources, developing new sources and ensuring regular delivery of water to all areas for all purposes. Mekorot is in charge of the bulk supply of water to urban communities, industries and agricultural users, and at present produces and supplies about two-thirds of the total amount of water used in Israel.

7.2 Civic engagement: the example of Citizens For the Environment (CFE) in the Galilee

Citizens For the Environment (CFE) is a non-profit environmental organization founded in 1990, by Jews and Arabs residing in the Western Galilee. According to the mandate of the organisation, the Galilee has been affected by major environmental problems, as a result of insufficient enforcement of environmental laws, lack of proper planning and environmental education and limited citizens’ awareness.

CFE’s activities cover mainly the protection of air and water quality, and the preservation of the natural landscape in Western Galilee. CFE monitors the status of environmental pollution and its influence on the health and well-being of the local population. CFE also undertakes educational programmes for raising the awareness of the population on environmental risks and sustainable development.

CFE has formulated a 5 year project plan (Conservation of Water Resources in the Galilee) to protect the Western Galilee’s water resources and maintain high water quality. The project will identify the sources of water contamination in the Western Galilee, inform the public of the related hazards, and create a network of environmental organizations that will collaborate with scientists, and local and governmental authorities to reduce ground water pollution. The Plan is comprises the following:

- Water monitoring and analysis of results through the building of a GIS system for the monitoring and analysis of environmental data.
- Closure of illegal garbage dumps (action in the supreme local courts, lobbying the Knesset for a change in legislation and budget priorities).
- Public pressure, together with other organizations, on local and regional government authorities to improve the disposal of effluents.
- Follow-up of industrial activities
- Public participation, by:
  - Representation of the public, on the Northern Region Planning and Building Committee;
  - Active membership in the Coalition for Public Participation in Planning, the Coalition for Public Health and the Life and Environment organization;
  - Increasing public awareness by the means of press releases, publication of bulletins and distribution to mailing lists will continue and expand;
  - Lobbying authorities for maximum transparency regarding information on polluting industry and business;
  - Community activity: initiating and extend programs for community activities that include Jews and Arabs, by assisting those threatened by hazards, due to such problems as proximity to polluting factories, and by helping local organizations and communities prepare letters of objection.
  - Education projects for diverse populations (cooperation of different ethnic groups and religions on environmental issues), and organization of clean-up campaigns, collecting signatures on petitions etc. (Citizens for the Environment in the Galilee, 2006).

7.3 Valuing Water

7.3.1 Extraction levies

The extraction/abstraction of water from all sources is charged with an extraction levy, which reflects the regional and national shortage and intends to internalize the external costs related to water shortage. The rates of the levy are fixed through regulations and updated occasionally.

The obligation for the payment of the extraction levy falls on the extractor. However, he is entitled to collect from his customers/consumers their share of the extraction levy, along with the financial cost, according to the quantity of water supplied to them. If the water extractor does not pay the extraction levy, the Water Commissioner has the right to cancel, suspend or change the extraction license of that extractor from the particular water source.

Additionally, and in order to promote various goals in the benefit of the water economy, the law sets a framework for granting allowances from the State budget for:

- The production and development of water sources of inferior quality, which can be used to produce water of acceptable quality for certain uses;

- The support of private water extractors, who bear a high water production cost. The aim is to support the continuation of their activities, since they are considered a positive competitive factor in the water economy;
- Operations for the improvement of degraded water bodies, with the aim of restoring their quality to meet drinking water standards.

7.3.2 Water prices

Water prices are the prices charged for water consumption, and are established between the production supplier and the consumer. Mekorot supplies two thirds of the water supply. The company is entitled to charge only the rates set by the Ministers of National Infrastructure and Finance, as approved by the Knesset's Finance Committee. The prices are updated regularly, according to the changes in the Consumer Price Index, electricity rates and the average wage index.

Rates are categorized according to the different uses: domestic, consumption and services, industry and agriculture.

The **rates for industrial and agriculture uses** are lower than those for domestic consumption and services for two main reasons:

- Water for agriculture and industry is designated for production.
- Water for agriculture is supplied on a less reliable basis and is of poorer quality.

Rates within the areas served by **local authorities** are set by the Ministers of Interior and Finance, based on the rate the local authority pays when buying water in bulk from Mekorot. The rates for agriculture and industrial uses within the local authority are identical, in principle, to Mekorot's sale price. However, the local authority collects distribution fees to recover the costs of distributing and supplying this water within the authority's domain.

Domestic consumption and service rates are set based on the rate paid to Mekorot and the amount needed to cover the expenditures entailed for supplying water meeting the required quality and reliability standards.

Domestic rates follow an Increasing Block Tariff structure (i.e. they are progressive and rise with an increase in the amount of water consumed). The first price corresponds to the initial 8 m^3 per month for each household. The second price corresponds to the next 7 m^3. For each additional cubic meter, the price increases gradually. Large families receive water price benefits - each additional family member over 4 persons is entitled to 3 additional m^3 per month charged with the first rate.

For **gardening and landscaping** a relatively low water rate has been set, identical to the first rate for domestic consumption. However, this stands only for a limited amount of water, i.e. 0.6 m^3/m^2 of garden, and no more than 300m^3/garden/year, and for the period between April-November.

The local authority obliges the immediate repair of the hidden **leakage** and payment for the water lost. If the local authority is convinced that repair of the hidden leakage has been carried out quickly and efficiently, it may charge for the water lost due to the leak according to the first rate of domestic consumption.

7.4 Sharing water

The right to water is not absolute, but is always for one of the purposes recognized by the Water Law. The purposes recognized by the Water Law are private right of water uses (domestic uses), agriculture, industry, handicraft, commerce, services and public services (Israeli Government Web Site, 2006). However, the water in itself cannot be subject to private ownership. However water production, pumping and supply equipment can and are in many cases, privately owned.

Each and every water use requires a license. This includes well drilling, extraction (production), supplying, consumption, subsurface recharging, and water treatment. All licenses are annually issued. In principle, the license is granted for one year and does not confer upon the recipient the right for a license in the following year. In fact, if there is no serious reason for the contrary, the license will be renewed. The license lists conditions that relate to quantities, qualities, procedures and arrangements of production and supply of water, increasing the efficiency of water use, preventing pollution, etc. The license may be revoked by the Water Commissioner if the conditions are not fulfilled or if the water use endangers the water source.

The Law does not prescribe priorities in water allocation. However, such are described in the **Water Regulations** which regulate water use in rationing areas (i.e. geographic areas in which the demand exceeds the supply and where water use should be rationalised). In those areas water allocation is granted upon the following order of priorities: (a) Domestic Uses; (b) Industrial Uses; (c) Agricultural Uses; (d) Other Uses. Since most of the country has been declared as a Rationing Area, this order of priority is, in fact, the general order of priority for water allocation in Israel.

Water allocation for each calendar year is fixed by the Water Commissioner for each of the categories mentioned above. The allocated quantities are annually adjusted to reflect changes in water availability and water needs.

Until 1995 **domestic uses** were subject to quota allocations. Since then, quota allocation for domestic water use was abolished. Nowadays water allocation in the domestic sector is solely regulated through a strict differential pricing mechanism. The rules concerning municipal supplies require that each consumer has an individual water meter, and that water is charged separately and not as part of the municipal levies[1].

Industrial uses are subject to quotas that are based on water use tables for the various industrial uses and annexed to the Water Regulations. The establishment of quotas for industrial plants whose production processes use more than 5,000m^3/yr, is based on the quantities ("norms") of water consumption, according to the type of product and scope of production. There are specific provisions relating to small consumers (i.e. up to 5,000-10,000m^3/yr). Water is supplied through the municipalities.

With regard to **agriculture**, there is a distinction between private agriculture and planned agriculture (kibbutzim and moshavim). Water allocation for planned communities is based on the water needs as defined in the agricultural plan for the community. Water allocation to non-planned communities is based on the type of agricultural growth, the growth stage of the tree and the geographical location of the plants/trees. Allocation is based on the water needs in the various regions of the country and normally water will not be allotted to regions where a particular agricultural activity is not considered economical.

[1] The amount of water allocated to the local authority for domestic consumption includes the use of water for domestic needs, gardening, auxiliary farms, services and public utilities, trades, commerce, etc. within the domain of the local authority.

Since 1986 the Water Commission has been following a policy of water quota reduction, in order to reduce pumping from the coastal aquifer (Pleistocene aquifer), which is undergoing a rehabilitation process. Additionally, an important change was initiated in 1993, related to the introduction of flexibility in the annual allocation date. In January, 70% of the overall allocation is determined for each agriculture sector consumer. The remainder is determined during the winter, according to the hydrological situation, but no later than April 1st of the same year.

After the depletion of the State of Israel's water sources in 1999, the Water Commissioner decided on a reduction in the water quotas for agriculture by a 40% average[1] and in the years 2000 - 2002 an average reduction of 50% was decided.

7.4.1 Water markets in Israel in the future?

Many analysts argue that creating a regional water market would depoliticize the water conflict in the Middle East and lead to more efficient utilization of natural resources by all parties. (Tal, 2004) The other point used to promote the development of water markets is related to the increasing financial feasibility and economic viability of desalination. It is considered that *"Desalination is transforming water from a "critical national resource" to a tradable commodity in public perceptions and gives some credence to the economic perspective"* (Tal, 2004). However, given the long history of the Israeli government's intervention in allocation policies, its traditional role as patron for local agriculture it seems that making such a shift in its policy orientation would be very difficult.

[1] 1998 was set as the basic year for the reduction.

8. Japan

Japan is the thirtieth most densely populated country in the world. About 70% to 80% of the country is forested, mountainous, and unsuitable for agricultural, industrial, or residential use, due to the generally steep elevations, climate, and risk of landslides caused by earthquakes, soft ground, and heavy rain. This has resulted in an extremely high population density in the habitable zones that are mainly located in coastal areas.

The climate of Japan is predominantly temperate but varies greatly from north to south. Japan's geographical features divide it into six principal climatic zones:

- Hokkaidō: The northernmost zone has a temperate climate with long, cold winters and cool summers. Precipitation is not heavy, but the islands usually develop deep snow banks in the winter.
- Sea of Japan: On Honshū's west coast, the northwest wind in the wintertime brings heavy snowfall. In the summer, the region is cooler than the Pacific area, though it sometimes experiences extremely hot temperatures, due to the Föhn wind phenomenon.
- Central Highland: A typical inland climate, with large temperature differences between summer and winter, and between day and night. Precipitation is light.
- Seto Inland Sea: The mountains of the Chūgoku and Shikoku regions shelter the region from the seasonal winds, bringing mild weather throughout the year.
- Pacific Ocean: The east coast experiences cold winters with little snowfall and hot, humid summers due to the southeast seasonal wind.
- South-west Islands: The Ryūkyū Islands have a subtropical climate, with warm winters and hot summers. Precipitation is very heavy, especially during the rainy season. Typhoons are common[1].

Japan has heavier precipitation than other countries in the area. However, the per capita precipitation approximates only a quarter of the world average. Precipitation also varies substantially according to the season and occurs mostly during the rainy and typhoon seasons. Similarly, river flows increase and decrease, causing floods or water shortages and having a severe impact on people's lives and economic activities (Japan Water Agency, 2006).

There are ranges of high mountains and short rivers in narrow spaces and the rainwater that falls on mountains quickly flows down to the sea. Dams and levees have been constructed to prevent floods and take designated quantities of water throughout the year. There are also many canals to convey water from rivers to farms and to water treatment plants.

Precipitation in Japan has recently been fluctuating drastically from year to year and has been on the decline from a long-term perspective. Low precipitation in some years and declining precipitation levels have been adversely affecting stable supply of water in major river systems.

Around 420 billion m^3 of water per year is available, of which 85.2 billion m^3, or 20% is actually utilised. The annual average precipitation is 1,718 mm. Japan often faces problems of shortage due to annual and seasonal fluctuations, as well as frequent occurrences of disastrous floods. The primary water use is agriculture (Kobayashi, 2005).

[1] http://en.wikipedia.org/wiki/Japan

Japan's rapid economic growth during the 1960s was accompanied by water pollution of increasing severity and scope. This period saw one ecological disaster after another, including Minamata Disease, caused by mercury contamination in the Agano River, and Itai-Itai Disease, caused by cadmium contamination in the Jinzu Rive.

Local governments began responding to the issue by establishing their own water-pollution regulations. In 1967, the national government enacted the Basic Law for Environmental Pollution Control, and then in 1970, the Parliament passed a number of pioneering anti-pollution laws. Then the following year, in 1971, the Environment Agency was established, which took over water-environment policy in order to provide centralized oversight for environmental conservation.

Nevertheless, during the 1970s environmental pollution became an increasingly serious issue around the Seto Inland Sea, due to overpopulation and growing concentration of industry. In 1978, a comprehensive and far-reaching series of laws was enacted to regulate levels of pollutants in the Seto Inland Sea, Tokyo Bay, Ise Bay, and other bodies of water, where organic pollutants were a recurring issue. Then in 1984, the Law Concerning Special Measures for the Preservation of Lake Water Quality was enacted to combat water pollution in freshwater bodies, where measures to date had failed to show results.

By the 90s, pollution has failed to show improvement in closed bodies of water such as bays, inland seas, and lakes and reservoirs. Chemical pollution became an increasingly serious issue. In 1989 the Water Pollution Control Law was revised to prevent the pollution of the water tables by toxic substances, and in 1990, it was revised again to strengthen measures against pollution from sewage. Then in 1993, a series of standards was enacted to prevent further chemical pollution of public waters. In 1996, the Water Pollution Control Law was again amended, incorporating measures to clean up groundwater pollution, and the following year (1997), Environmental Quality Standards (EQS) were established for groundwater pollution.

By 2002, there was an increasing movement towards regulating soil pollution. The government planned out a strategy for combating soil pollution. In May 2002, the Soil Pollution Control Law was passed by the Parliament, and went into effect on February 15, 2003 (Waternunk, 2006).

8.1 Governing water systems

8.1.1 The River Law

River administration in Japan has been motivated by two main objectives, to control river flooding and to ensure availability of river water for daily and industrial use. In accordance with the River Law, river administration is performed through the classification of rivers, their subdivision into sections, and the delegation of responsibility for the administration for the different sections. River systems deemed important for the national economy and people's lives are designated as “Class A river systems” and are administrated by the Minister of Land Infrastructure and Transport. The rest are designated as “Class B river systems” and administrated by the prefects (local governments). “Class A river systems” are further classified into “Trunk rivers” and “Others” with the latter being administered by the prefects, except for the case of approval of certain, specific water rights. Some sections of small tributaries of both class A and class B rivers, where part of the River Law is applied are set. Administration of the rest is performed by the mayors of cities, towns, and villages. Other smaller rivers not belonging to the above classification and to which the River Law is not applied at all, are administered by mayors. The total length of “Class A rivers”, which includes 109 river systems, is approximately 87,150 km; the length of “Class B rivers”, which includes 2,691 river systems, totals approximately 35,720 km, and the total length of rivers to which the River Law is applied is approximately 132,870 km. The River Law stipulates that any utilization of land and river water within the sections defined by the River Law must obtain approval from the designated river administrator.

8.1.2 *Water governance*

Water resources Development Public Corporation (WARDEC) was transformed into the Japan Water Agency (JWA), Incorporated Administrative Agency in October 2003. The Japan Water Agency, on the basis of the Basic Plan for Water resources Development (Full Plan) for each of the seven river systems (Tone, Ara, Toyo, Kiso, Yodo, Yoshino and Chikugo River Systems), is responsible for the construction of dams, estuary barrages, facilities for lake and marsh development and canals.

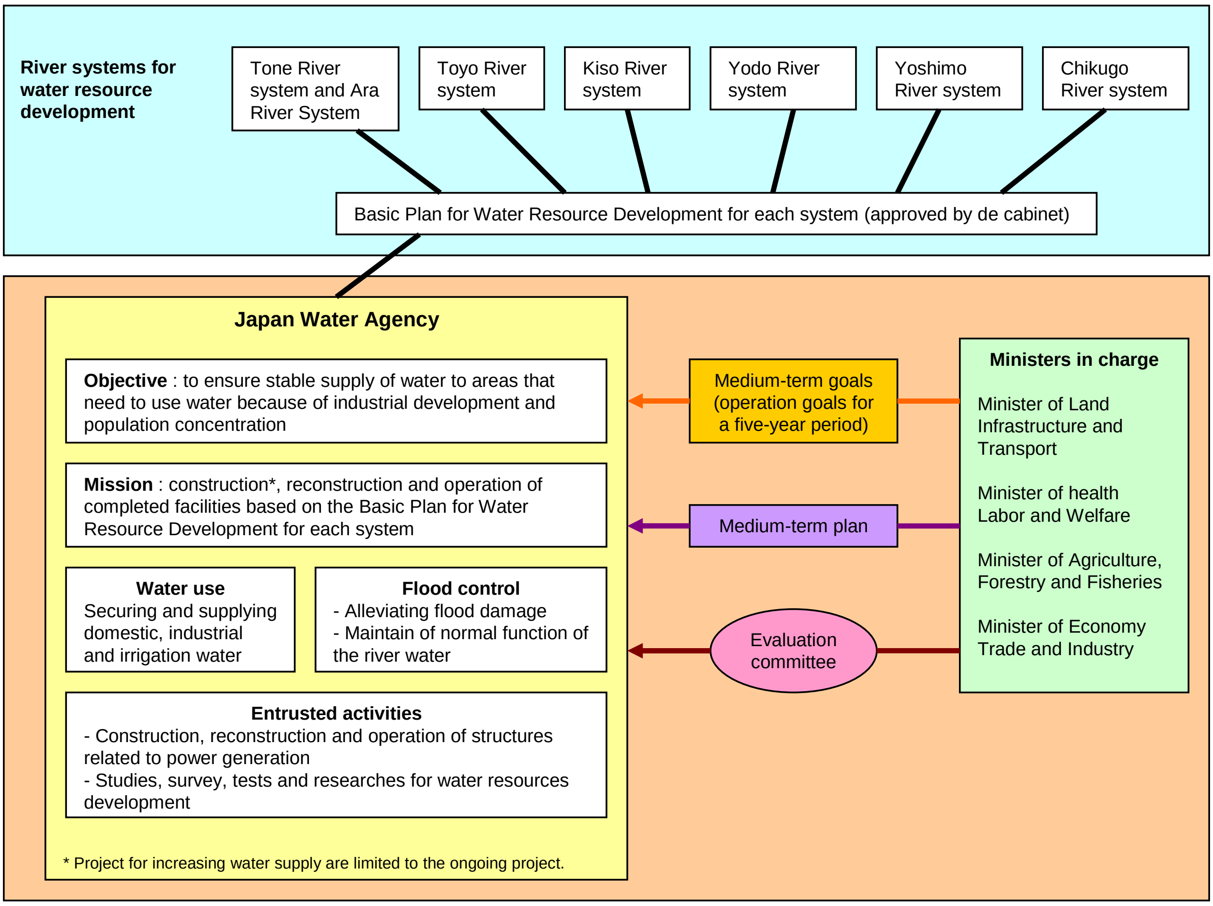

Figure 8: Rivers systems - The different actors of water governance in Japan

Additionally, the Japan Water Agency operates, manages and renews completed facilities. The activities of the Japan Water Agency range widely, from securing water for domestic, industrial and agricultural use to flood control, and maintaining and improving normal functions of the river water (e.g. securing vested water and conserving the river environment). Issues related to personnel and financial accounting of the Japan Water Agency are placed under the supervision of the Ministry of Land, Infrastructure and Transport. The Minister of Health, Labour and Welfare, the Minister of Agriculture, Forestry and Fisheries, the Minister or Economy, Trade and Industry or the Minister of Land, Infrastructure and Transport are held responsible for project implementation depending on to the objective of the projects. The different actors involved in the administration of the water system are outlined in Figure 5.

8.2 Valuing Water

Japan has a complex system of water rights, as outlined in Section 8.3. It should be noted that the River Law **does not allow a water right holder to sell his right to water to other possible water users** under any circumstances. No efforts have been made to introduce water right trading, although there has been some debate on the issue.

However, a water right may be subject to transfer, if the right maintains the same characteristics throughout the process. When a water right transfer is being performed, the right has to be returned first to a River Administrator, and a new water right must be obtained by applying for permission from the Administrator.

8.3 Sharing water

8.3.1 Ownership

Concerning **surface water**, according to the River Law *"A river is a property for public use, and its conservation, utilization and administration shall be properly performed so as to attain previously stated purposes. The water of a river cannot be made the subject of a private right."*

There is no law comprehensively dealing with **groundwater** use and its exploitation. According to the Article 207 of Civil Law, the ownership of groundwater under a private land belongs to its land owner. In other words, the ownership of a land incurs the ownership of groundwater, and the two ownerships cannot be separated. A water right, therefore, is not required for using groundwater as long as it is withdrawn at the land and the land is outside of designated "River Areas". The Civil Law is the only statute dealing with the right of access to groundwater. There are two public laws controlling groundwater uses, the Industrial Water Law (1956) and the Law for Regulating Groundwater Use for Buildings (1962). Both laws have been enforced in specifically designated areas, to control land subsidence due to overdrafting of groundwater. At a local level, groundwater uses are controlled by the regulations of local governments (Nakashima, 2003)

8.3.2 Water rights

There is no statute in Japan which provides a definition of the water right in itself. However the River Law of 1965 sets forth provisions regarding the formal allocation of water through administrative procedures. The Law defines river water as public property and a certain quantity of river water may be allowed to withdraw for an exclusive use by obtaining permission. The River Law, in Article 23, states that *"any person who intends to use the water of a river shall obtain the permission of the River Administrator, as provided for details by Ministry of Construction Ordinance"*. This is the provision which is regarded as defining a right to use river water, i.e. a water right (Nakashima, 2003).

The Multipurpose Dam Law (Article 15) enables water users to obtain a right to use reservoir storage ("Dam Usufructuary Right"), which is a property right and similar to a water right in the nature. Water users with the purposes of municipal water supply, industrial water supply and hydropower generation may apply for the Dam Usufructuary Right by sharing the cost of dam construction.

Concerning the **Water Rights administration**, anyone who intends to divert water from a river must apply for a permit from the "River Administrator", who administers the river subject to the water diversion. The application has to be filed with following proofs and documents:

- Descriptions of the project which necessitates water intake.
- Computational grounds for the applied quantity of water intake.
- Results of water balance computations dealing with river flows, the applied quantity of water intake and the quantity of prior appropriations.
- Proofs showing intended water intake facility does not bring adverse effects of floods.
- Results of investigating prior appropriations.
- Results of investigating timber transportation.
- Results of investigating fishery activities.
- Results of investigating historical and scenic points.
- Present land uses and compensatory measures for anticipated adverse effects, in case a storage facility is planned.
- Plan of construction activities and design of facilities, in case construction works are planned.
- Agreement documents of prior water right holders and documents explaining the reasons of non-agreement.
- Proofs indicating the right to use properties belonging to others, if such a use is intended.
- Documents showing necessary permissions from government agencies concerned.
- Other relevant documents, if necessary.

After the application is filed, the River Administrator has to inform and coordinate with the concerned government agencies: for a Class A river, he must "consult with Ministers" and "ask opinions of Prefecture governors"; and for a Class B river, he must "ask opinions of municipal mayors." This process is called "River Consultation".

The River Administrator is required to inform prior appropriation holders, who do not agree with the water right application under consideration, as well as to the fishery right holders who may be affected by adverse effects of the following: name of an applicant, purpose of water use under application, place of water use, quantity of water intake, description of structural facilities, anticipated adverse effects on the prior appropriation holders and the river users, as well as planned remedial measures to the effects.

Within 30 days after receiving the information, recipients may submit their claims against the water right application, by submitting the following: name of the claimant, descriptions of the claimant's business associated with the river, descriptions of adverse effects on the claimants business, an estimate of monetary compensations and its detailed ground, reasons of opposition to the applied water intake and date of receiving the information from the River Administrator.

The River Administrator examines the application and makes a decision based on the following criteria:

- The water use purpose must be reasonable and beneficial to the public.
- There must be certainty in realizing the water use and related activities.
- The applied quantity of water intake must be reasonable considering river flow characteristics.

- There should not be adverse effects against public interests by the planned installation of structural facilities and construction works.

For the first and the second criteria, the River Administrator must consider reasonableness of the water use purpose, sound coordination between the applicant's development activity and the relevant regional plans, reasonableness in the quantity of water intake and capability in project implementation of the applicant. For the third criterion, river flow characteristics, current status of prior appropriations, instream flow needs and a water balance at the upstream storage facilities are examined. For the fourth criterion, the River Administrator examines the following points: sound relation between planned structural facilities by the applicant and planned flood control facilities by the River Administrator, effects on the facilities under River Administrator's responsibility and measures for environmental conservation (Nakashima, 2003).

In case there are claimants, all the prior water right holders and fishery right holders concerned must agree with the applied water use before the River Administrator grants a water right. Regardless of the oppositions, he can grant a water right if the applied water right is more important for the public benefits than prior water rights and also if an instalment of structural facilities for a remedial purpose is expected to solve possible damages on the claimants. The applicant must compensate any loss incurred, after consultation with the River Administrator.

A water right permit defines terms and conditions of a granted right. The permit is required to respect all prior rights when diverting under the permit, which is a reflection of the appropriation doctrine. Other terms and conditions include a water use purpose, quantity of water intake and consumption, method of intake, and periods of intake in a year. Details differ for different water use purposes. Generally, a water right is valid for 30 years for a hydropower use and 10 years for other purposes, however, continuity of the right is guaranteed as long as an actual water use continues. The period of validity in permitted right is simply to make an assessment of a proper use (Nakashima, 2003). Concerning transfer of water rights according to a River Law statute a water right transfer has to be applied to and approved by a River Administrator. By regulation, a water right transfer from one water use purpose to another is not allowed. When a water right transfer is planned, a present water right holder and an intended water right recipient must file an application to a competent River Administrator. The application must be accompanied by a description of project, which necessitates the water use, and the River Administrator should consult with the governmental agencies concerned.

9. Concluding Remarks

This report has reviewed the strategic approaches developed in several countries to deal with the issues of investment financing and cost recovery for water services, water sector administration and public participation, and water allocation and the establishment and management of water rights. The following paragraphs aim to summarize the outcomes of this review, and discuss implications for the INECO project according to the particularities and specific characteristics of the Mediterranean context.

9.1 Water Sector Administration, Water Rights and Water Allocation

The management of the water sector in **Argentina** is decentralized, with developed local agencies of the Secretariat of Natural Resources in each area. Each province has and regulates its own financial charges, with different modalities according to the importance it places on the resource; the issue is generally advocated in all provincial water legislation. There are no real mechanisms for regulating the privatization of water services, and in several cases there were significant social protests again private companies. Private companies also had to face the economic crisis and most of them decided to leave Argentina.

According to the **Australian** constitution, water in the country is the responsibility of the State and Territory governments. Each has independent water laws and distinct policies. In New South Wales, the State studied in this report, catchment management institutions are moving from a community-based model towards a quasi-government system. The price of water is very low and as such it does not providing incentives to households for water conservation. Water trading was introduced in Australia in the early 1980s to encourage a shift to more efficient water allocation and to activate water entitlements that were not being used. Water trading within the framework of strict environmental constraints is seen as one of the main mechanisms available to achieve the efficiency improvements of water allocation mechanisms.

The **State of California** has developed a strong administration to deal with water resource management. The water resource protection efforts of the State Water Resources Control Board and the Regional Water Quality Control Boards are guided by a five-year Strategic Plan. A key component of the Strategic Plan is a watershed management approach for water resource protection. It is important to notice that California Water Boards have created a new public participation program to strengthen their efforts at involving the public in the decision-making processes. California has a unique system of surface water rights that combines a traditional riparian system with the appropriative system found elsewhere. A compensated transfer system for water or water rights called “water market” has been developed.

In **Canada**, the federal government’s role in protection and management of sources of local water supplies is very limited. The federal government has no direct role in regulating water abstractions off federal or aboriginal lands. In most provinces, the responsibility for the protection of surface and ground waters from inappropriate or unsustainable uses and contamination is fragmented among numerous provincial and local agencies, with no agency having a clear leading responsibility. Nevertheless, public participation in environmental assessments has been a regular practice for many years. With regard to water pricing, Canada is one of the developed countries with the lowest commercial water rates. A complex system of riparian rights has been developed in the country, where rights can be classified into six categories: (a) the right of access to the water, (b) the right of drainage, (c) the rights relating to the flow of water, (d) the right to undiminished quality of water (pollution), (e) the right to use of water, and (f) the right of accretion.

In **Chile**, the State is responsible for a) Measuring and determining the availability of water resources; b) Regulating the use of water resources; c) Conserving and protecting water resources. The privatisation of Chilean water companies is cited as an example of good practice by the World Bank. An important part of the 1980s water legislation reform was a new methodology for the definition of tariffs, which aimed at raising water prices to meet the true financial cost of the service. As a result of the large rate increases, a new mechanism was developed to protect the economically vulnerable households: a subsidy, targeted to individual customers. The Water Code of 1981 established permanent and tradable water use rights with the objective of achieving an efficient allocation of water resources. Some authors pointed out some aspects of lack of IWRM due to the way this tradable water rights are used in Chile: a) Economic and water use inefficiencies; b) Externalities and conflicts; c) Many stakeholders or end-users are not present when debating water policies or in the Organization of Water Users.

Israel has built its water administration on the principle that: "*Only a centralized allocation of water resources can ensure the optimal use of the limited water resources*". The governance of water systems is the mission of the Water Commissioner, who is responsible for the overall management of Israeli water resources with the aim of ensuring a steady water supply to all citizens over time and for diverse uses (domestic, industrial and agricultural use). Nevertheless the system allows for civic engagement and the activities of Citizens For the Environment (CFE), a non-profit environmental organization dealing with the protection of air and water quality, and the preservation of the natural landscape in Western Galilee could be cited as a good practice. The extraction/abstraction of water from all sources is charged with an extraction levy, which reflects the regional and national shortage and intends to internalize the external costs related to water shortage. The rates of the levy are fixed through regulations. Concerning water price, rates are categorized according to the different uses: domestic, consumption and services, industry and agriculture.

River administration in **Japan** has been motivated by two main objectives: to control river flooding and to ensure availability of river water for daily and industrial use. The activities of the Japan Water Agency range widely, from securing water for domestic, industrial and agricultural use to flood control, and maintaining and improving normal functions of the river water. Japan has a complex system of water rights but the River Law **does not allow a water right holder to sell his right to water to other possible water users** under any circumstances. No efforts have been made to introduce water right trading, although there has been some debate on the issue.

From all the examples cited above, it is evident that there is a shift towards the decentralisation of water policies, with water management responsibilities being delegated to regional rather than central governments. The only two exceptions of the analysed example are Israel (where the importance of water scarcity and the existence of extensive inter-basin transfer have contributed to the strong centralisation of water management), and Japan. Similarly, Massarutto and Paccagnan (2007), in their review on the implementation of WFD in arid and semi-arid countries note that "*all the countries considered have known important administrative reforms in the past decades, all emphasising a tendency towards regionalisation against centralisation of public policies*".

9.2 Economic instruments: Administrative vs. Market-based water allocation

In some countries (e.g. Australia, Canada and USA), water rates are low, and recovery of water service costs is low. In other countries, where there the need for water sector investments is more pronounced (e.g. Argentina) prices are rising to cover investment needed, resulting to significant societal conflicts, targeting also the involvement of the private sector. The Chilean practice of subsidy, targeted to individual customers is a good example of a policy for addressing such conflicts and for ensuring access to water services.

The policy of tradable water rights in California and Australia are very well known examples of economic instrument for sharing water. Similarly, the example of the Spanish "water banking" constitutes another European example on the implementation of economic instruments in water allocation (Massarutto and Paccagnan, 2007). In summary, it should be noted that according to the policies reviewed in this report, two main strategies can be used for water allocation:

- Administrative methods;
- Implementation of economic instruments.

The following paragraphs aim at briefly describing the advantages and disadvantages of both approaches according to the World Bank review of Dinar et al., 1997.

9.2.1 Administrative Water Allocation

Three main points support the argument for public or government intervention in the development and allocation of water resources: it is difficult to treat water like most market goods, water is broadly perceived as a public good, and large-scale water development is generally too expensive for the private sector.

Public allocation intends to promote equity objectives that is, ensuring water supply to areas of insufficient quantity. It can protect the poor, sustain environmental needs, and provide a given level of water to meet minimal needs in the receiving sector. The physical allocation of water among the users is independent of the charge. Allocation rules in this case can be based on historical facts (such as prior rights), on equal shares in available water volumes, on individual requirements, or even based on political pressure.

The following arguments support an important role of the administration in water allocation mechanisms:

- Large, lumpy capital requirements and economies of scale in water infrastructure tend to create natural monopolies, warranting regulation to prevent overpricing. Moreover, many water investments produce joint products, such as recreation, electric power, flood control, and irrigation, which make pricing and allocation decisions difficult.
- The large size and extremely long time horizons of some investments, given underdeveloped capital markets and the potential for political interference in many water infrastructure investments, reduce incentives for private investments in the sector,
- The uses of water within a river basin or aquifer are interdependent. Withdrawals in one part of the basin reduce the availability of water for other users; groundwater pumping by one user may lower the water table and increase pumping costs for all users; and pollution by one user affects others in the basin, especially those located downstream. These interdependencies

suggest that having all users agree to the rules of the game--or lacking that, imposing government regulations, taxes, or both-could improve the social value of water resources.

- Certain aspects of water activities, such as the control of floods and waterborne diseases, are (local) public goods, which cannot easily be charged for on the basis of individual use. In such cases, public initiative may be required to ensure that levels of investment are appropriate.
- Water resources are often developed because of their strategic importance for national security and for regional development. Governments thus typically maintain ownership of water thoroughfares providing services such as the coast guard and traffic regulation. Some regions are subject to periodic droughts. Because water is essential to sustaining life, governments may take control o water

Supplying water to deficient areas leads to expensive, publicly financed water projects which preclude any need to purchase water rights based upon the scarcity of the resource. In other words, subsidized water supply development replaces market mechanisms of water supply via transfers of water titles. Prices, as a result, do not represent either the cost of water supply or its value to the user. Publicly-mandated penalties on misuse of the water quota can fail to incorporate the value of numerous goods and services which are either difficult to price or are not bought and sold.

As a result, public allocation mechanisms often lead to waste and mis-allocation of water, as well as fragmented investment and management of the existing resource. Also, public allocation often does not support user participation. In many cases, these results contradict the original policy goals in the basis of the public intervention. Namely, social objectives are not fulfilled.

Public allocation or regulation is clearly necessary at some levels, particularly for intersectoral allocation. However, some authors pointed out that problems with this form of allocation are seen in poor performance of government-operated irrigation systems, leaking municipal water supply systems operated by public utilities, licensing irregularities and inadequate controls over industrial water use, and damage to fish and wildlife habitats.

According to these authors, major reason for such problems lies in the failure of the public allocation mechanisms to create incentives for water users to conserve water and improve use efficiency. Under public management the dominant incentive to comply is coercion; that is, setting regulations and using sanctions for those who break them. But this type of incentive is only effective if the state detects infractions and imposes penalties. In many cases the state lacks the local information and ability to penalize

Another disadvantage of administrative allocation is that the structures of fees for water use under pubic allocation often do not create incentives for the users themselves to save water and use it more efficiently. The vast majority of irrigation systems, and even many domestic water supply systems, charge a flat rate per hectare or household served. Under this type of fee, not only do the users not pay according to the amount of water consumed by that land or that household, but increasing the water charges-a simplistic solution too often suggested to improve water use efficiency-can even have a perverse effect of increasing water consumption as people feel that they are entitled to more water because they are paying more.

9.2.2 Market-based allocation[1]

According to several authors, water markets provide several benefits. The seller has an opportunity under certain conditions to increase profitability (except if all water resources are sold and the seller ceases economic activity). The buyer benefits because the water market encourages increasing water availability. In the case of water trade between the agriculture and the urban sectors, the environment may benefit in two ways. First, the water market induces a shift towards improved water management and efficiency in agriculture, reducing irrigation-water-related pollution. Second, with the water market, farmers may afford to internalize externality cost, or even pay higher pollution-related social cost.

The following potential benefits of water markets could be pointed out:

- Empowerment of water users by requiring their consent to any reallocation of water and compensation for any water transferred.
- It provides security of water rights tenure to the water users. If well-defined rights are established, the water users can invest in water-saving technology knowing that they will benefit from the investment.
- A system of marketable rights to water induce water users to consider the full opportunity cost of water, including its value in alternative uses, thus providing incentives to efficiently use water and to gain additional income through the sale of saved water.
- A system of tradable water rights provide incentives for water users to take account of the external costs imposed by their water use, reducing the pressure to degrade resources.
- Compared to the often-recommended volumetric pricing of irrigation water, the rights-based approach would be more acceptable to farmers. Imposition of volumetric pricing would be seen by farmers as expropriation of traditional water rights, which would create capital losses in established irrigated farms. Establishment of transferable water rights would instead formalize existing rights to water.
- Allocation of water through tradable rights provides maximum flexibility in responding to changes in crop prices and water values as demand patterns and comparative advantage change and diversification of cropping proceeds. The market-based system is more responsive than centralized allocation of water.

Several unique characteristics of water present special challenges in the design of a well functioning water market. A list of these difficulties include: measuring water, defining water rights when flows are variable, enforcing withdrawal rules, investing in necessary conveyance systems, sale of water-for-cash by poor farmers, and finally, externality and third party effects and environmental degradation: A transfer of water from agriculture to urban use may reduce return flows, which may affect a third party. In addition, increased industrial and urban water use may create extensive environmental pollution if necessary measures to limit industrial and municipal untreated sewerage disposal are not introduced.

Effective market allocation requires that third-party effects of water trades can be identified and accurately quantified, and the associated costs are fully taken into account in the exchange process. The pervasiveness of externalities such as changes in downstream and return flows, pollution, overdraft of water tables, waterlogging, and other adverse, often irreversible environmental effects, provides the fundamental argument against markets. From the economic efficiency viewpoint, these

[1] Market-based allocation of water is referred to as an exchange of water-use rights.

externalities should be considered in the cost of the transfers. From the equity viewpoint, compensation for these third party effects should be paid to those who have been harmed as a result of the agreement.

9.3 Implications for the INECO Project

Water allocation, administration and governance, and application of economic instruments have always had a high social and economic importance in the countries of the Mediterranean basin, where water availability and management of water resources constitutes a major problem and often results in higher water charges, especially during periods of extensive droughts. The concern over water pricing and the transparency in decision-making in the region is gaining interest, especially under the pressure of the global climate change, which by many is expected to mainly affect the Mediterranean region and make climatic and hydrological conditions more and more unpredictable in the area.

Effective tradable water rights systems are not easy to introduce; and countries could face high transaction costs. Unregulated water markets could also lead to environmental issues and monopolies, and under-investment in activities that may be socially but not privately profitable. On the other hand, similar characteristics render administrative solutions to water allocation difficult. It should also be noted that, for historical and cultural reasons the introduction of such economic instruments would be very difficult. Similarly, the fragmentation of responsibility for water management is one of the main problems, and should be addressed in conjunction with participatory and transparent procedures required to improve the accountability of water competent authorities. The implementation of river basin organizations with strong power[1], already under implementation in several regions, seems to be a solution, which could lead to improved water management at the local level.

However, it should be noted that the progress in the reform of water institutions and policies, in order to address incoherent water property rights, fragmented institutional structures and inefficient and unequal cost allocation has been too slow and too limited in a number of countries, including those presented in this deliverable. During the last years and according to the specifications set out by the Water Framework Directive for better valuation of water and water infrastructure, a lot of research has concentrated on the estimation of full water cost and cost recovery. However, with users becoming more involved in managing water resources, the concept of management transfer has been a central theme in valuing water. In this context, the governance modalities can be linked with water valuation and financing.

In this regard, the establishment of a transparent procedure that allows the participation of all relevant stakeholders could help decision-makers in planning sustainable regional development efforts in an increasingly complex socio-economic context and in conserving resources at the same time. Therefore, there is need for implementing a holistic approach that will assess the interrelation of water demand, water supply and full water costs. Such an approach provides valuable information for the formulation and application of an integrated management framework and improves existing institutional frameworks by promoting a participatory decision making approach.

[1] By *strong power* we mean collection of tax, programming and financing infrastructures and actions for water resource management.

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