OVERVIEW OF WATER MANAGEMENT IN TURKEY: ISSUES, CONSTRAINTS, ACHIEVEMENTS, PROSPECT

Selmin Burak

Istanbul University, Institute of Marine Sciences and Management, Turkey

ABSTRACT

The major systematic aspect of water related activities in Turkey is central planning. At the national level, the objective of the Five-Year Development Plans' (FYDP) is to ensure the optimum distribution of all kinds of resources among various sectors of the economy. The latest, 9th, plan covers the period of 2007-2013 with the major goal related to environmental protection and public infrastructure development. This plan underlines the fact that rapid urbanization and industrialization process is a pressure on the sustainable use of water resources; that although progress has been made, uncertainty with regard to institutional plurality and fragmentation across sectors remains. This issue is a big challenge on the way to substantial reforms with regard to water resources management. Therefore better cooperation and coordination is needed between institutions. Water management is gradually improving towards a sustainable development policy by internalizing the concepts of water demand management in the municipal, industrial and agricultural sectors.

Keywords: water resources, water management policy, water use, sustainability, institutional framework

INTRODUCTION

Turkey has encountered environmental concerns comparatively late, but from the 1970's onwards rapid and uncontrolled urbanization and industrial activities have brought environmental problems to dangerous levels in water catchment areas and coastal zones, in particular. Turkey has developed its water management policy taking into consideration the present and future water needs for its growing population, rapid urbanization, and developments at global and regional levels, as well as the on-going EU accession process. Turkey is a negotiating candidate country to the EU and has started the process of harmonizing its water-related legislation with that of the European Union. A project fiche that aims to assist Turkey in the implementation process of the EU Water Framework Directive has been prepared. The national objective is to pursue a sustainable development policy based on the principles of the international conventions to which the country is signatory. For the past thirty years the governmental approach has been endeavoring to raise awareness of environmental issues and encourage implementation of conservation measures in the policy documents.

This paper gives an overview of the water sector in Turkey, challenges on the way to sustainable development across an assessment of the existing situation against globally and nationally accepted management criteria.

DEMOGRAPHY

The census results of 2000 give a figure of 67.4 Million for the country's total population, with an average annual population growth rate of 1.26 % (2005 data) (SPO, 2006). The corresponding GNP is US$5042/capita (2005 data) (SPO, 2006). According to the national population projections, the total population was 73 million in 2006, with an annual population growth rate of 1.21%.

Due to migration from rural to urban areas during the last decade, there has been an increase of 25% in urban population, resulting in a significant increase in water demand in the corresponding areas. The census results of 2000 showed that 65% of the population lives in urban areas. Recent results show that 61.4% (2006 data) of the population lives in urban areas, whereas out of the overall urban population, one third lives in the three biggest metropolises, Istanbul, Ankara and Izmir (SPO, 2007).

The largest industrial and commercial center of Turkey is the province of Istanbul and its surroundings, where 40% of industry is located. Since the water resources are unevenly and disproportionately distributed over the country; this situation has led to the implementation of large water conveyance projects for utility water supply to large metropolises. Topographical and geological conditions in some drainage basins do not permit the construction of dams for the storage of water for consumer use. Therefore approximately only half of the water potential can be made economically available for consumption. The Ministry of Environment and Forestry, General Directorate of Environment Management stipulates in the UN Report, that Turkey is situated at the critical threshold value with regard to per capita water demand. The report states that the total water quantity will decrease by 10% in 2020. As a consequence, Turkey is expected to be a water-stressed country by 2030; which means that efficient management of water resources is crucial and urgent measures must be taken to support sustainable development policies.

HYDROLOGY AND WATER RESOURCES

Annual mean precipitation in Turkey is 643 mm, which corresponds to 501 billion m^3 of the annual water potential. 274 billion m^3 evaporate from inland water bodies and soils to the atmosphere, 227 billion m^3 is split between groundwater infiltration and surface runoff. 69 billion m^3 leaks into the groundwater, and out of this volume, an amount of 28 billion m^3 is retrieved by springs contributing to surface water. A volume of 7 billion m^3 inflow is received annually from the neighboring countries. The balance gives 234 billion m^3 of gross renewable water potential for Turkey, out of which amount (227-(69-28)+7)=193 billion m^3 constitutes the total annual renewable surface water. However, under the current technical and economical conditions, the annual exploitable potential is computed to be 112 billion m^3 as the net volume, composed of 95 billion m^3 of surface water resources, 14 billion m^3 of groundwater and 3 billion m^3 of influx from neighboring countries (Figure 1).

Annual Water Resources Potential

Average precipitation: 643 mm/year
Surface area: 780 000 km^2
Annual water potential: 501 billion m^3
Evaporation: 274 billion m^3
Internal (national) total runoff: 227 billion m^3
Leakage into groundwater: 69 billion m^3
Springs feeding surface water: 28 billion m^3
Total net infiltration: 41 billion m^3
Internal (national) surface runoff: 186 billion m^3
Total surface inflow (gross) from neighboring countries: 7 billion m^3
Total surface runoff (gross): 193 billion m^3
Exploitable surface runoff (of which net inflow: 3 billion m^3): 98 billion m^3
Groundwater safe yield: 14 billion m^3
Total exploitable water resource: 112 billion m^3
Runoff coefficient: %37

Source: DSI, 2007

Turkey comprises 25 hydrological basins as shown on Figure 2 and Table 3. The annual average flows of these basins amount to about 186 km^3. While basin yields vary, the Euphrates and Tigris basin accounts for 28.5% of the total potential of the country (DSI, 2007).

Unconventional water resources are not used at municipal level. However, in arid regions and on Mediterranean coastal areas wastewater reuse for irrigation and gardening is strongly recommended by

the Ministry of Environment and Forestry through their regional directorates, encouraging wastewater reuse for summer homes, hotels and gulf resorts, in particular.

DSI is responsible by law for the operation and maintenance of the dams, therefore, it can modify the beneficial water use purposes and operation of dams that were set initially at the planning phase in line with emerging new water patterns, as a result of changes with regard to climatic conditions and/or demand by users after their commissioning (e.g. climate change issues, requests by riparian users for additional or different needs from those planned initially).

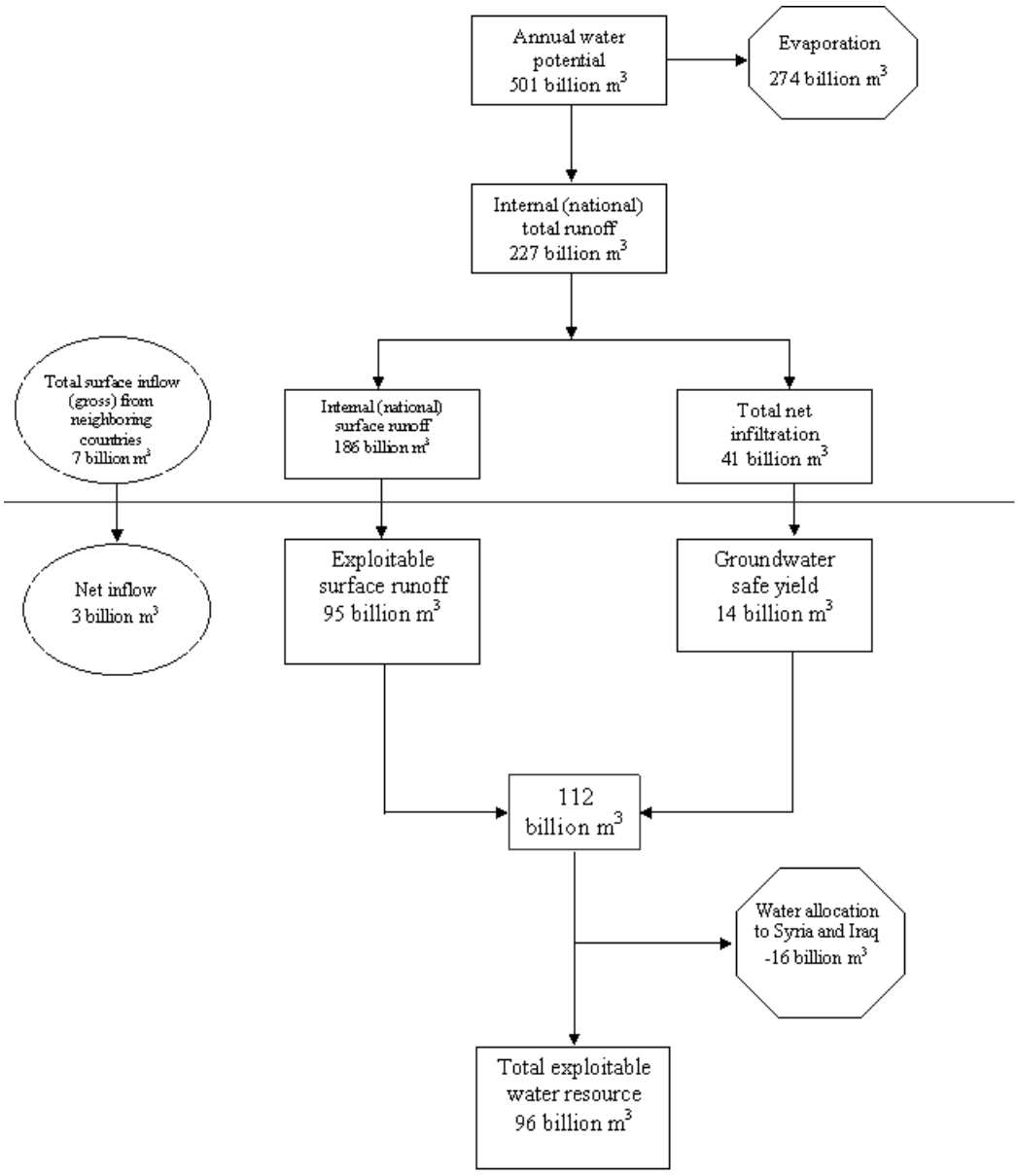


Figure 1. Annual water resources potential of Turkey

Source: International River Basins Management Congress, DSI, 20-24 March 2007, Antalya, Turkey.
Figure 2. Hydrological basins of Turkey

TABLE 3. Hydrological features of watersheds

Name of Basin	Precipitation Area (km^2)	Mean Annual Runoff (km^3)	Potential Ratio	Mean Annual Yield ($l/s/ km^2$)
(21) Euphrates Tigris Basin	184.918	52.94	28.5	21.4
(22) East Black Sea Basin	24.077	14.90	8.0	19.5
(17) East Mediterranean Basin	22.048	11.07	6.0	15.6
(09) Antalya Basin	19.577	11.06	5.9	24.2
(13) West Black Sea Basin	29.598	9.93	5.3	10.6
(08) West Mediterranean Basin	20.953	8.93	4.8	12.4
(02) Marmara Basin	24.100	8.33	4.5	11.0
(18) Seyhan Basin	20.450	8.01	4.3	12.3
(20) Ceyhan Basin	21.982	7.18	3.9	10.7
(15) Kızılırmak Basin	78.180	6.48	3.5	2.6
(12) Sakarya Basin	58.160	6.40	3.4	3.6
(23) Çoruh Basin	19.872	6.30	3.4	10.1
(14) Yeşilırmak Basin	36.114	5.80	3.1	5.1
(03) Susurluk Basin	22.399	5.43	2.9	7.2
(24) Aras Basin	27.548	4.63	2.5	5.3
(16) Konya Closed Basin	53.850	4.52	2.4	2.5
(07) Büyük Menderes Basin	24.976	3.03	1.6	3.9
(25) Van Lake Basin	19.405	2.39	1.3	5.0
(04) North Aegean Basin	10.003	2.90	1.1	7.4
(05) Gediz Basin	18.000	1.95	1.1	3.6
(01) Meriç-Ergene Basin	14.560	1.33	0.7	2.9
(06) Küçük Menderes Basin	6.907	1.19	0.6	5.3
(19) Asi Basin	7.796	1.17	0.6	3.4
(10) Burdur Lakes Basin	6.374	0.50	0.3	1.8
(11) Akarçay Basin	7.605	0.49	0.3	1.9
TOTAL	779.452	186.86	100	

Source: DSI, 2007

An average 25% of energy production relies on hydroelectric power generation, and represents only 33% of the national potential. Comparative hydroelectric power generated in OECD countries and per capita energy consumption is given in Table 1 and Table 2 respectively (IEA, 2000).

TABLE 1. Comparative hydroelectric potential and use ratio

Countries	Economically Exploitable H.E. Energy TWh	Hydro-electric production in 1998		
		Installed Capacity GW	Energy TWh/year	% of H.E potential use
Turkey	125,3	10,3	42,2	33,7
Sweden	130,0	16,3	74,4	57,2
France	100,0	25,1	66,0	66,0
Italy	65,0	20,0	47,4	72,9
Greece	20,7	2,9	3,9	19,5
Portugal.	19,8	4,5	13,0	65,7
Japan	114,3	43,9	102,6	89,8

TABLE 2. Comparative per capita energy consumption

Countries	Increase of population (%)	Area (10^3 km^2)	Total Installed Capacity (GW)	Total Energy (TWh)	Consumption	
					Amount (TWh)	In year (kWh/capita)
Turkey	1,5	780,0	23,3	111,0	87,7	1382
Greece	0,4	132,0	10,0	46,4	41,0	3909
Spain	0,2	506,0	50,0	195,3	169,6	4320
Italy	0,2	301,0	72,5	259,8	260,8	4537
France	0,4	552,0	112,6	510,9	393,2	6734
Germany	0,3	357,0	113,6	556,4	487,4	5950
Japan	0,3	378,0	222,4	1046,3	936,6	7441
U.S.D	1,2	9364,0	784,8	3832,6	3347,8	12559
Norway	0,6	324,0	28,3	117,0	109,9	25105

Source: IEA/energy statistics of OECD countries 1997-1998.

Water demand and pressure on resources

Countries can be classified according to their water wealth as rich, insufficient or poor; for which the yearly per capita threshold values are 8000-10 000m^3, 2000 m^3 and less than 1000 respectively**.**

Based on the renewable water resources potential of 112x10^9 m^3 and on population projections, it is predicted that Turkey will fall into the water-stressed category beyond 2030, as can be seen from Table 4 and Figure 3.

In conclusion, since water needs increase in parallel with population growth, the crucial point is to improve the water use efficiency for all of the sectors. Table 5 gives the water use per sector, Figure 4 illustrates comparative ratios for each sector.

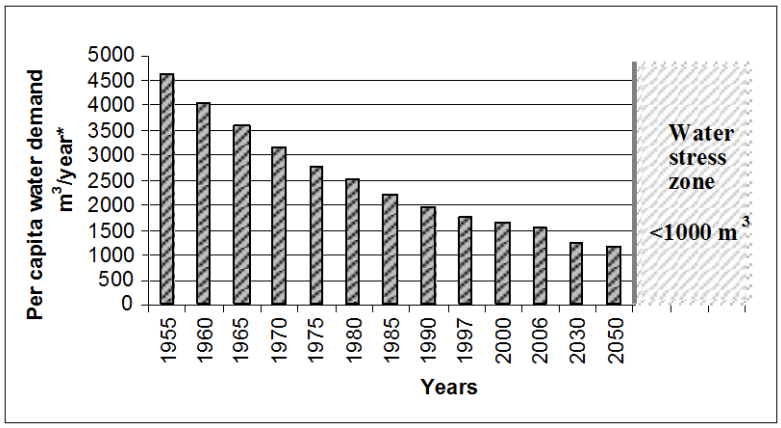
Water is supplied from surface and groundwater resources for all purposes. Agriculture is the highest water-consuming sector with an average rate of 75%, followed by domestic water use at 15% and finally the industrial sector at 10%, according to the DSI records. Approximately 90% of the total water use for irrigation is withdrawn from rivers.

At present, almost the totality of the urban population is connected to the water supply network, and in rural areas this ratio is close to 90%. A daily allocation of 170 liter/capita is made for drinking water supply. Unaccounted-for water has a high average varying from 35-65% depending on the network and location.

TABLE 4. Per capita water demand

Years	Population census results	Per capita water demand (m^3)/year*
1955	24064763	4654
1960	27754820	4035
1965	31391421	3568
1970	35605176	3146
1975	40347719	2776
1980	44736957	2504
1985	50664458	2211
1990	56473035	1983
1997	62865574	1782
2000	67803927	1652
2006	73000000	1534
2030	90800000*	1233
2050	96000000*	1116

Source: www.belgenet.com



*Population projection by TURKSTAT

Figure 3. Evolution of water demand since 1955

Wetlands

In the early 1950s, malaria epidemics represented a severe threat to human health, as in many other countries, and the resulting drainage of thousands of hectares of marshes resulted in loss of wetlands. One of the major tasks of DSI was to drain marshes hosting malaria vectors and causing epidemics in the hot regions of Turkey in particular. After the 1970s, the successful result of campaigns to eliminate malaria on the one hand, and rising environmental awareness on the other, halted the ill-advised policy of draining marshes. Based on the DSI's records, more than 100 000 ha of marshes were dried out between 1955 and 1970 as reflected Figure 5. Starting from the 1980's, DSI has stopped completely drying out marshes due to rising environmental awareness and policy changes towards sustainable development of water resources. Within the framework of integrated watershed management, DSI is cooperating with institutions concerned for the integrated management of wetlands. In line with this policy, DSI is implementing rehabilitation projects to recover degraded wetlands.

Turkey became a signatory to the Ramsar Convention for the protection of wetlands in 1994. Since the signing of the convention, several communiqués and circulars have been published in order to implement the convention, and the first 'Regulations about the protection of the wetlands' were issued in 2001 and their scope expanded with the revisions carried out in 2005. Within the scope of the regulations, wetlands, regardless of the criteria whether they are cited as wetlands having international importance or not, are all under protection without exception.

TABLE 5. Allocation of water use by sector (million m^3)

Year	1990	%	1992	%	1994	%	2000	%	2004	%	2030	%
Agriculture	22,016	72	22,939	72,5	24,623	73,5	29,3	75	29,6	74	72	*64*
Industry	3,443	11	3,466	11	3,584	11	4,2	10	4,3	11	22	*20*
Household	5,141	17	5,195	16,5	5,293	15,5	5,8	15	6,2	15	18	*16*
Total	**30,600**		**31,600**		**33,500**		**39,300**		**40,100**		**112,000**	
Development		**27**		**28**		**30**		**35**		**36**		***100***

Source: This table is computed with the DSI figures.

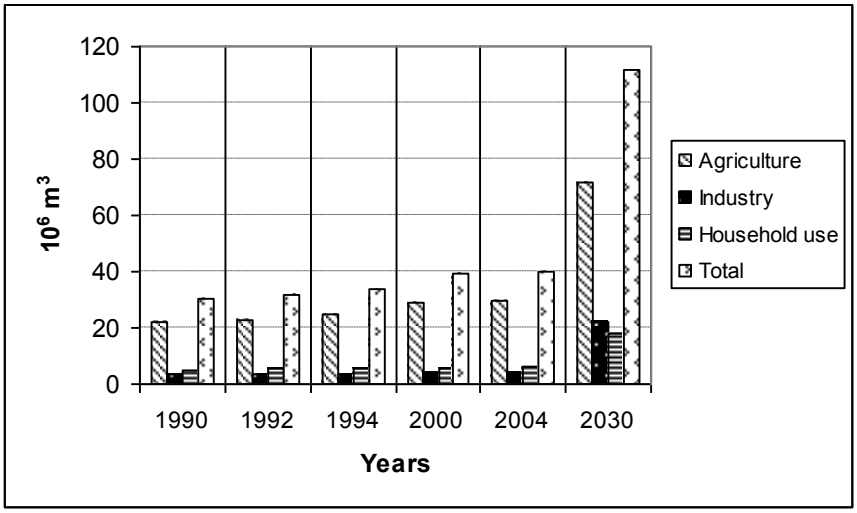


Figure 4. Comparative water use ratio by sector

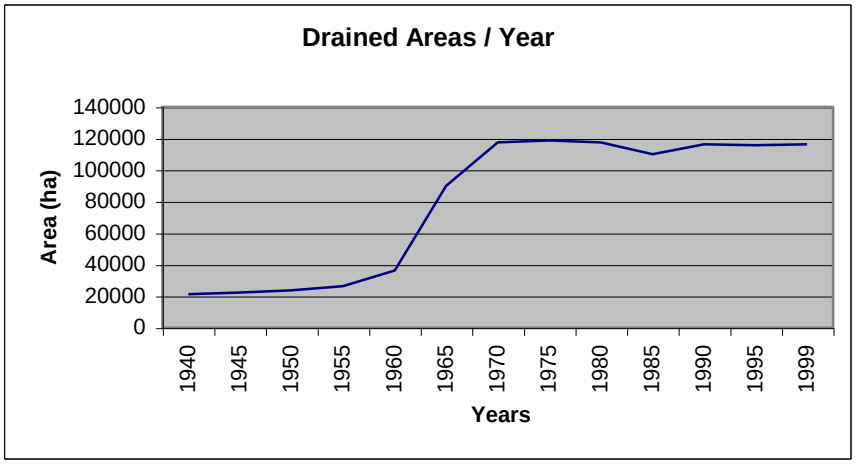


Figure 5. Drained marshes between 1955-1999

Agricultural Water Use

Up to the early 1980s, operations and maintenance (O&M) for irrigation systems was highly centralised, but this was imposing an increasing institutional and financial burden on the government. Contributing factors were: very low ratio of billing and collection rates or no collection at all; very high water consumption, even wastage; no cost recovery for investment; and no local interest by the farmers to protect the infrastructure.

Although some small irrigation schemes had been transferred to users over the years, the pace of change was slow. However, after 1993, on the advice of the World Bank, an accelerated process of handing irrigation O&M over to Water User Associations has been undertaken.

The recovery rate for (O&M) costs increased from less than 40% to more than 80% after the facilities had been handed over to water users' organisations (WUOs). In addition, water overuse and consequent negative environmental impacts (e.g. salinity) have gradually decreased. After PIM 'the irrigation program that was [formerly] a government program with assistance of the farmers' became 'a farmer program with assistance of the government'

However, the reform has not been accompanied by appropriate legal reform (e.g. giving title to WUAs) which has caused some problems in investment, furthermore, while WUAs must raise revenues from tariffs, the lack of legal basis has meant that incentive structures are weak.

Despite a few concerns related to WUAs, the Turkey case "the accelerated transfer of the irrigation schemes from the governmental institution to WUAs" is regarded as a success story in the Mediterranean Basin.

TERRITORIAL ADMINISTRATIVE STRUCTURE

Turkey comprises 81 provinces covering the territory of the whole country. Each province is headed by a Governor, appointed by the Council of Ministers and approved by the President. Provinces may be divided into districts, each with their own appointed District Governor or sub-Governor. Within a province, there are four types of local authorities:

Municipalities: There are 3,225 municipalities that have been established in areas with more than 2,000 inhabitants. They cover about 75% of the country's land mass and the average municipality has a population of 15,000. Each municipality is headed by a directly elected mayor and governed by an elected municipal council.

Metropolitan Municipalities: In 16 of the main urban areas in Turkey, the municipalities are organized under umbrella organizations referred to as Metropolitan Municipalities, empowered by the Metropolitan Municipalities Act passed in 1984. Municipalities in metropolitan areas are called district municipalities and retain many functions as agreed with the superior local body in charge of the whole metropolitan area. Metropolitan areas are formed by an act of Parliament and all have separate water and sewerage utilities.

Villages: Turkey has about 35,000 villages that are governed by elected head-man (Muhtar) and a council-of-elders in line with ancient Turkish traditions. The average village has a population of about 500.

Special Provincial Administrations (SPAs): There are 81 SPAs in the country; one in each province. The SPAs cover areas that fall neither within municipal nor village boundaries. The local authority functions within an SPA are carried out by the provincial administration under the provincial Governor.

INSTITUTIONAL FRAMEWORK

The institutional framework of Turkey is based on a centralized approach with de-concentrated governmental institutions. More than ten governmental institutions together with their regional directorates and local/municipal agencies operate according to specific laws and regulations in water management issues. These institutions are divided in two groups, one responsible for investment and the other for inspection. Figure 6 shows the institutional structure of the water sector. The major investment agencies of the sector are as follows:

The Ministry of Public Works and Settlement has an important role in the development of municipal and territorial plans. At the regional level, the SPO is responsible for carrying out land-use plans, and establishing their management rules by providing protection/usage balance. Affiliated to this ministry is the Bank of Provinces, an investment agency in charge of the planning, construction and financing of drinking water and municipal wastewater treatment.

The Ministry of Energy and Natural Resources is responsible for supplying the energy needs of Turkey, including hydroelectric power stations and large combustion plants through the General Directorate of Electricity (EIE).

The Ministry of Culture and Tourism is responsible for the designation and conservation of all cultural, historical, archaeological and natural heritages, and is authorized to undertake preservation, rehabilitation and implementation measures related to such sites and authorized to designate tourist areas and undertake important implementation measures in these areas with respect to drinking water, municipal wastewater and solid waste disposal.

The major inspection agencies of the water sector are as follows:

The Ministry of Foreign Affairs determines the external politics with regard to environmental issues with other ministries, institutions or organizations concerned. Specifically, the General Directorate of State Hydraulic Works and Ministry of Foreign Affairs in Turkey are responsible for the management of trans-boundary waters.

The Ministry of Agriculture and Rural Affairs is responsible for land use and water resources development in rural areas. The Ministry monitors surface waters in agricultural areas for nitrate and pesticide run-off pollution. It acts as an inspection agency together with the Ministry of Environment and Forestry for receiving water suitable for fisheries and aquaculture, and for pesticide control.

The Ministry of Health plays an important role in certain aspects of environmental protection through its responsibilities for public health. Prior to the establishment of the Ministry of Environment, the Ministry of Health was responsible for environmental matters in general. In the water sector, it has particular responsibilities for drinking water and bathing water quality. The Ministry of Health also issues permits to industrial installations with regard to their production and emission and undertakes air quality monitoring with the objective of public health protection.

The Ministry of Labor and Social Security has joint responsibility with the Ministry of Environment and Forestry for adopting and implementing legislation aimed at the prevention of industrial accidents at large installations.

The Ministry of Interior has responsibility for local government exercised through the provincial administration. The provincial governors are assigned by the Ministry and are in charge of all local government agencies.

The Ministry of Industry and Trade will have important responsibilities with the Ministry of Environment Forestry in the implementation of the EU industrial pollution control sector, especially with regard to industrial pollution prevention and control.

The General Secretary of European Union is responsible for the coordination between different governments concerning international programs of conformity activities of the European Union rules.

Additionally, the **Undersecretariat of Treasury, Undersecretariat of Customs** and **Undersecretariat of Foreign Trade** cooperate with institutions with regard to financial issues in particular.

The Ministry of Environment and Forestry plays an overall coordinating role for the development and implementation of environmental policies; it has general duties relating to the protection and management of forests with nature protection objectives. The Ministry of Environment and Forestry is directly associated with the accession process together with the General Secretariat for EU Integration, the Undersecretariat of the State Planning Office and the Undersecretariat of the Treasury, all of which carry major responsibilities for the environment. Also under the Ministry of Environment and Forestry is the Authority for Protection of Special Areas (APSA). This Authority has special responsibilities for the thirteen Special Protected Areas established for the protection of certain habitats and species.

LEGISLATIVE STRUCTURE

After the 1920s, measures to prevent water pollution have been incorporated in numerous laws, regulations and directives enacted by Parliament and other authorized bodies, and in the provisions of international conventions to which Turkey is a signatory. Most of this legislation, including that in the Constitution, embodies provisions for protection of the environment and public health. The latest and most effective law among many others that have been promulgated since 1923 is the Environment Act that covers the protection of natural resources and human health.

The legal structure envisaged by the Environment Act consists of a system of technical regulations and standards that specify the principles of implementation. The Water Pollution Control Regulations promulgated in 1988 are one of the most important and comprehensive components of this system. These regulations define the technical principles for the protection of surface and groundwater.

Provisions for the protection of coastal water quality is also an integral part of the regulations, whose objectives are to protect potential water resources, efficiently manage water resources, prevent or eliminate water pollution. They deal with four main topics: 1-classification of water courses; 2-direct discharge to receiving waters from point sources; 3-municipal wastewater systems; 4-discharge permissions and monitoring.

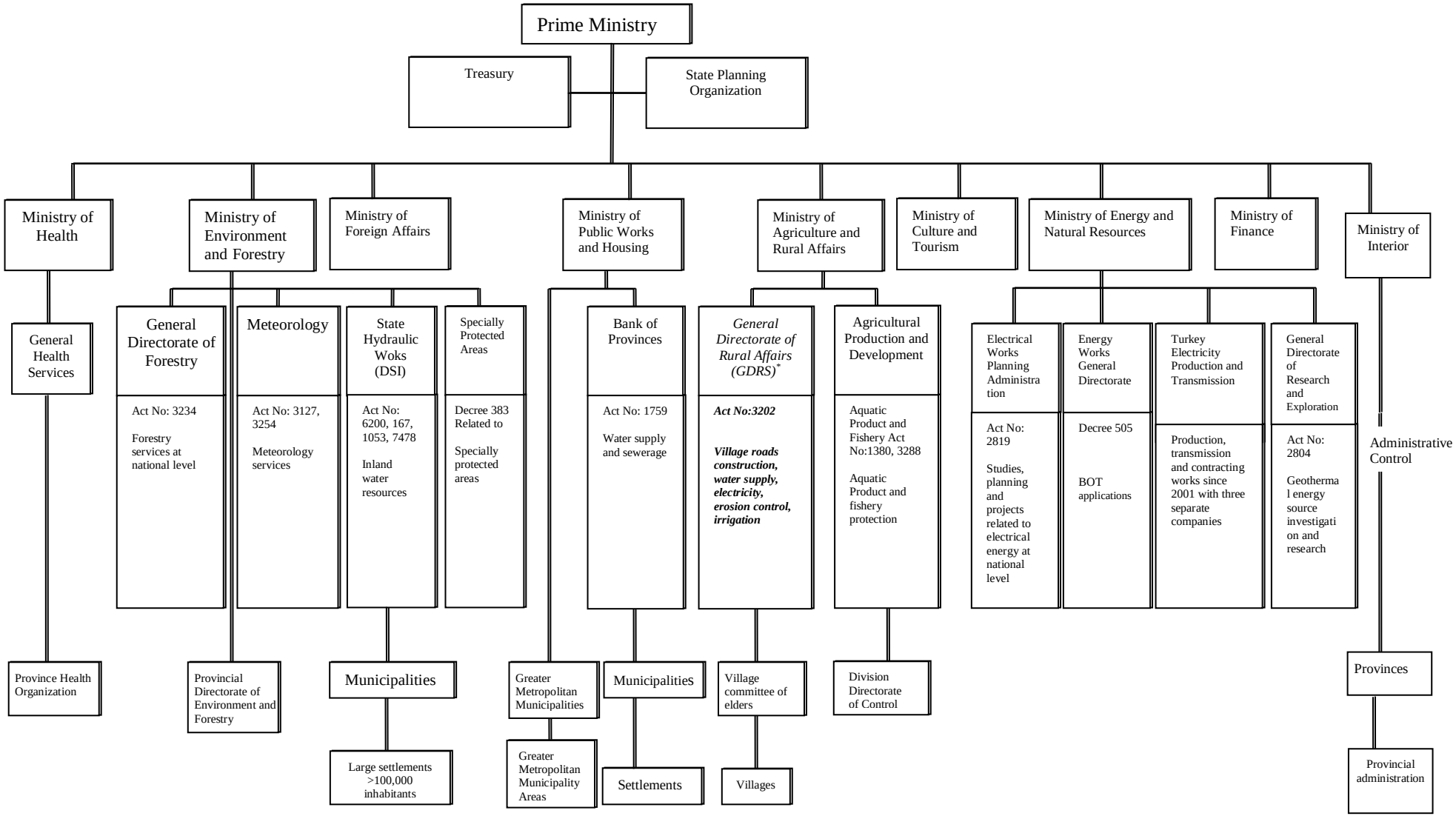
The ‘polluter pays’ approach is the guiding principle of the regulations. Therefore every polluter has to inform the state authorities about the amount and content of his wastewaters and apply for a discharge permit in which the conditions for discharge and the amount of required treatment is stipulated.

Among other items, the regulations define the conditions of use of municipal sewerage and treatment systems, discharge standards and the conditions for payment. Provisions concerning hazardous wastes in aquatic environments are also defined in the Water Pollution Control Regulations. Metropolitan municipalities are also authorized by Act No. 3030 to formulate, specify and apply within their boundaries the legislation required for the most efficient management of water and wastewater facilities.

Since its establishment in 1923, the Republic of Turkey has been undergoing important and vital changes in its legal and institutional structure. The latest major legal and institutional change is being experienced with regard to the EU accession process, concerning the harmonization of the Turkish legislation with the EU Water Framework Directive. The introduction of five-year plans was the first attempt at the adoption of a long-term and centralized policy-making approach related to public investments, whose planning and programming was entrusted to the State Planning Organization (SPO) operating under the Prime Minister’s Office. The SPO is charged with developing economic, social and environmental policies for the five-year development plans, and preparing annual programs and public investment programs that are implemented by the related central and local agencies and institutions that function within their establishment law. Turkey is currently implementing its 9th Development Plan (2007-2013).

Formulation of Standards and Enforcement

Standards are set up in the legal framework of laws and regulations. The Turkish Drinking Water Standards as well as metropolitan municipalities and international standards determine the quality control of drinking and utility water. Quality standards of receiving waters are set up both in the Aquatic Products Act and in the Water Pollution Control Regulations promulgated by the Ministry of Agriculture and the Ministry of Environment respectively.



* *Abolished according to Law No.5286 enacted in March 2005.Personnel and duties have been transferred to the SPA's.*

Figure 6. Institutional structure of the water sector.

The Water Pollution Control Regulations and Aquatic Product Act mostly dictate discharge standards to receiving waters.

Institutions are authorized to enforce the standards laid down in the regulations applicable in the field in which they are empowered by their statutes. By law, they are entirely free to set these standards as they think fit. Once promulgated in the Official Gazette their regulations become law. Regional offices are informed about the enforcement of these standards by their central office, and if necessary, seminars are held on the subject.

The inadequacy of laboratory facilities, equipment and personnel required to put the regulations into practice obstructs the efficient operation of the inspection mechanism responsible for enforcement.

ENVIRONMENTAL MANAGEMENT

The legal infrastructure of the existing system is inadequate. The unfair penalties, overlapping powers invested in different bodies authorized to implement the law, and the lack of equipment, throws doubt on the viability of decisions reached. As a result, when disputes are taken to court, the authority concerned usually loses the case.

There is a need for revision of penal sanctions, lawyers specializing in environmental law, and environmental courts, as well as public awareness of environmental issues.

For a better legislation enforcement in the water sector, the need for an integrated water resources management policy is stipulated at all institutional and legal levels. To do so, surface and groundwater resources must be managed integrally, the close relationship between the inland and coastal marine water must be considered as part of management, and consensus must be ensured among water, soil and forest management policies. These policies that were set lately in the National Environmental Action Plan (NEAP) issued in 1998, have started to raise awareness among various central institutions. But putting substantial changes into practice is a long-term process involving acceptance by relevant bodies and various stakeholders (SPO, 1998).

The NEAP has been a useful tool for the assessment and achievement of the set objectives and for the introduction of new decision making concepts in this respect. Environmental Performance Indicators that measure the trend towards or away from pre-determined objectives were decided to monitor the NEAP. Three types of indicators, a) pressure-state-response; b) procedural; and c) policy-based indicators, were adopted for this purpose.

NATIONAL POLICY WITH REGARD TO WATER RESOURCES DEVELOPMENT

The fact that approximately 1/3 of the national potential for hydropower generation is used; the national policy is to extend this ratio with new projects. The target is to utilize the total available exploitable potential of the country amounting to 112 billion m^3 with the ongoing and planned projects.

The overview of the water sector proves a trend towards development in hydroelectric power, irrigation and drinking water schemes, which are inevitably supporting supply-side demand. This is mainly due to the fact that Turkey has not achieved its economic development yet. Turkey has developed only 36% of its hydroelectric potential as of today; and it is planned that 93% of the economical potential will be completed in 2020.

The per capita resource is decreasing (a decrease from 1500 m^3/capita in 2004 to 1200m^3/capita is foreseen for 2030 based on a population projection of 90.8 million in 2030 and 96,5 million in 2050 according to TURKSTAT). Under these circumstances water quality protection becomes very important for the availability of the resource for every sector and to ensure that quality does not become a limiting factor for quantity.

CRITICAL ANALYSIS

At the central level, the institutions operating in the water sector act in accordance with their establishment law that is investment-oriented in most of the cases (e.g. DSI, the biggest in the sector). Investment agencies hold the economic instruments, they have the power to orientate governing policies; inversely, inspection agencies are not adequately supported with technical and financial tools. Institutional strengthening, capacity building programs have been granted so far by international organizations or bilateral aid; nonetheless institutional reforms have not acquired a satisfactory level yet. Existing legislation need to be revised and extended according to real needs in existing/planned fields on the basis of a thorough evaluation of conditions in Turkey and long-term data. Feasibility of enforcement and economic deterrence should be primary concerns in this process (Burak, 1994).

Different sectoral studies carried out so far have stipulated the same institutional reforms, but their implementation remains a major challenge even today because of the concerns highlighted in the present report and elsewhere.

There is a need for a clear vision, a coherent articulation of strategic concerns, the establishment of clear responsibilities and incentives at each level of responsibility, setting out what should be subject to central regulation and consistent national and enforceable standards taking economic affordability, and the implementation process into account. Improved co-operation and co-ordination is needed between the existing institutions, which therefore must be equipped with better operational skills and instruments.

Constraints

- Constraints on effective management can be enumerated as: legislative, institutional, and financial
- Plurality and fragmentation of the institutional structure result in lack of coordination between institutions.
- No single Ministry or body with overall responsibility for water
- Although water and sewerage administrations are semi-autonomous and have separate budget, utilities are under direct political/financial control in broad term
- Little comparative performance data available
- Neither economic nor environmental role fully developed
- No cost recovery from customers
- Some municipalities have the skills needed but the great majority do not
- No direct incentives to improve services to customer
- No financial incentives as a national policy to encourage WUS's to install less water consuming techniques

Achievement

- Modern techniques increasingly introduced in DSI's schemes,
- Increase of efficiency in Water User Organization's operated irrigation schemes (PIM),
- Unaccounted-for water detection in Greater Metropolitan Municipalities Water and Sewerage Administrations,
- Users pay, polluters pay principle for quantity and quality control (progressive tariff structure, classification of industries according to their pollution loads, incentives for the use of cleaner technology, internal recycling encouraged with economic deterrence)
- Bathing water quality control with blue flag incentives
- EU accession process (River Basin Models, integrated water resource management)

Needed Improvement

- Need financial incentive and economic deterrence with regard to economic tools
- Improved O&M, training,
- New financing models
- Better co-operation and co-ordination between institutions
- Better comparative service performance indicator
- Applicable standards
- Better enforcement

Consensus within the government (and a process for reaching that consensus) on what is the appropriate balance between environmental and economic objectives must be established. Otherwise there will be no consistency in decisions taken at a more local level (Ballard, 2005).

Constraints on effective management can be enumerated as legislative, institutional, managerial and financial.

The major bottleneck of the environmental sector encountered in the institutional structure is the plurality and fragmentation that result in lack of coordination between institutions.

On-Going Reforms and Studies

Turkey has carried out a number of reforms in the water sector with regard to the improvement of financial efficiency (e.g. cost recovery of O&M of public water services in urban water and irrigation facilities) Significant efforts are being undertaken to help establish how best to deliver the directives concerning water quality. This work includes:

1-MATRA/ Büyük Menderes Basin Project

The objective of the MATRA Project applied in the Büyük Menderes River Basin was to support Turkey with the implementation of the WFD on a national and regional level. The aims are to:

1-Improve knowledge of the WFD and other European Legislature within water institutions,
2- Develop a methodology for implementing the WFD in Turkey,
3- Prepare a pilot river basin management plan to be used as an example for further implementation in Turkey,
4- Inform public and policy makers regarding the implications of the WFD for Turkey.

2-EU Integrated Environmental Approximation Strategy (UÇES) for the period of 2007-2023

The Ministry of Environment and Forestry has prepared a policy document entitled UÇES (EU Integrated Environmental Approximation Strategy) for the development and implementation of environmental policies with the participation of various institutions that play an important role and have responsibilities in the implementation of the Acquis Communautaire. This document was issued in March 2007 after approval by the government and covers the period between 2007-2023. It is prepared based on the output of the 'National Environmental Action Plan', 'Integrated Harmonization Strategy Project' and 'Environmental Heavy Cost Investment Planning Project'. The UÇES vision of Turkey is defined as "a country where the fundamental needs of today's generation as well as that of the future will be met, and where higher standards of life will prevail, biological diversity will be protected, natural resources will be managed in a rational manner with an approach of sustainable development, a country where the right to live in a healthy and balanced environment will be protected".

The fundamental purpose of UÇES is to establish a healthy and viable environment by taking into consideration the economic and social conditions prevailing in Turkey and establish the harmonization

of the national environmental legislation with the EC Acquis Communautaire and ensure its implementation. The corresponding investment need is 70 Billion Euros.

Acknowledgments

This paper is based on the national report entitled 'Water demand management in the Mediterranean, progress and policies' presented at the Zaragoza Forum in March 2007 and supported by the UNEP/MAP/Blue Plan and data provided by the Turkish Ministry of Environment and Forestry.

References

Ballard J., 2005. Restructuring of the Turkish Water Sector for the Implementation of EU Water Directives, UK-Turkey Cooperation Workshop, Ankara.
Burak S., Gönenç E. and Erol A., 1994. Institutional and Legislative Structure of Water Quality Management in Turkey, Wat. Sci. Tech. Vol.30, No. 5. pp.261-268.
DSI, 2007. International River Basins Management Congress, 20-24 March, Antalya, Turkey.
IEA, 2000. Energy Statistics of OECD Countries 1997-1998, International Energy Agency, Paris.
SPO, 2006. 9th Development Plan (2007-2013).
SPO, 2006. 2007 Annual Program, Protection of Environment and Improvement of Urban Infrastructure.
SPO, 1998. National Environmental Action Plan.
www.belgenet.com/arsiv/nufus.html
www.ramsar.org
www.dsi.gov.tr/toptaksu.htm
www.planbleu.org/