22 March 2009 World Water Day - Painting Contest Second Winner of Primary School Category: HELiN SiNEM DAĞLI
Acknowledgements

This Turkey Water Report has been prepared by a team comprising of Hasan ÖZLÜ (State Hydraulic Works) and his colleagues Adem Avni ÜNAL, Dr. Hüseyin GÜNGÖRDÜ, Ahmet Hamdi SARGIN, Dr. Sevgi DONMA, Dr. Özlem ŞENOL, Melike KÖKTAŞ and Simla Yasemin ÖZKAYA (Ministry of Foreign Affairs).

The team has the great honor receiving the encouragement of H.E. Prof. Dr. Veysel EROĞLU (Minister of Environment and Forestry) and Mr. Haydar KOÇAKER (General Director of State Hydraulic Works). The significant coordination of Mr. Hasan ÖZLÜ (Forum Coordinator of General Directorate of State Hydraulic Works) in producing and editing the document is highly recognized and appreciated.

We highly appreciate the reviews and valuable comments received from the Ministry of Foreign Affairs, Ambassador Mrs. Sumru NOYAN, Mrs. Sibel ALGAN, from Gebze Institute of Technology Assoc. Prof. Güleda ENGİN.

The team also extends deep thanks to the all other institutions and departments that have contributed to the report.
ABBREVIATIONS

TABLE OF CONTENTS

FOREWORD .................................................. 1

CHAPTER 1 - GENERAL ASPECTS ......................... 3

CHAPTER 2 - WATER AND LAND RESOURCES .......... 6

CHAPTER 3 - WATER MANAGEMENT ...................... 12

CHAPTER 4 - WATER AND ENVIRONMENT ............. 31

CHAPTER 5 - THE SOUTHEASTERN ANATOLIA PROJECT .... 36

CHAPTER 6 - TURKEY’S TRANSBOUNDARY WATER POLICY .... 46

CONCLUSION .................................................. 51
### ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbr.</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOT</td>
<td>Build-Operate-Transfer</td>
</tr>
<tr>
<td>CATOM</td>
<td>Multi-Purpose Community Centers</td>
</tr>
<tr>
<td>CC</td>
<td>Civil Code</td>
</tr>
<tr>
<td>CFRD</td>
<td>Concrete Faced Rockfill Dam</td>
</tr>
<tr>
<td>DSI</td>
<td>State Hydraulic Works</td>
</tr>
<tr>
<td>EEC</td>
<td>European Economic Community</td>
</tr>
<tr>
<td>EIA</td>
<td>Environmental Impact Assessment</td>
</tr>
<tr>
<td>EU</td>
<td>European Union</td>
</tr>
<tr>
<td>FAO</td>
<td>Food and Agriculture Organization</td>
</tr>
<tr>
<td>GAP</td>
<td>Southeastern Anatolia Project</td>
</tr>
<tr>
<td>GAP-RDA</td>
<td>Southeastern Anatolia Project - Regional Development Administration</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>GNP</td>
<td>Gross National Product</td>
</tr>
<tr>
<td>HEPP</td>
<td>Hydro Electric Power Plant</td>
</tr>
<tr>
<td>ICOLD</td>
<td>International Committee on Large Dams</td>
</tr>
<tr>
<td>IPCC</td>
<td>Intergovernmental Panel on Climate Change</td>
</tr>
<tr>
<td>IPGRI</td>
<td>International Plant Genetic Resources Institute</td>
</tr>
<tr>
<td>IUCN</td>
<td>International Union for Conservation of Nature</td>
</tr>
<tr>
<td>MDGs</td>
<td>Millennium Development Goals</td>
</tr>
<tr>
<td>MED POL</td>
<td>Mediterranean Pollution Programme</td>
</tr>
<tr>
<td>mha</td>
<td>million hectares</td>
</tr>
<tr>
<td>O&amp;M</td>
<td>Operation and Maintenance</td>
</tr>
<tr>
<td>RCC</td>
<td>Roller Compacted Concrete</td>
</tr>
<tr>
<td>SPA</td>
<td>Special Provincial Administrations</td>
</tr>
<tr>
<td>TEFER</td>
<td>Turkey Emergency Flood and Earthquake Relief</td>
</tr>
<tr>
<td>UN</td>
<td>United Nation</td>
</tr>
<tr>
<td>UNDP</td>
<td>United Nations Development Program</td>
</tr>
<tr>
<td>UNDP</td>
<td>United Nations Development Programme</td>
</tr>
<tr>
<td>UNEP/MAP</td>
<td>United Nations Environment Programme / Mediterranean Action Plan</td>
</tr>
<tr>
<td>UNESCO</td>
<td>United Nations Educational, Scientific and Cultural Organization</td>
</tr>
<tr>
<td>WUAs</td>
<td>Water User Associations</td>
</tr>
<tr>
<td>WUOs</td>
<td>Water User Organizations</td>
</tr>
<tr>
<td>WWF</td>
<td>World Wild Fund for Nature</td>
</tr>
</tbody>
</table>
FOREWORD

The world as a whole has witnessed a substantial increase in water and energy consumption during the last century as a direct result of rising affluence, rapid urbanization, industrialization and population growth. This trend is anticipated to continue in the decades to come. One of the greatest reasons is the unplanned industrial activities deteriorating environment in the name of rising standard of life. What is needed is the avoidance of environmental pollution and maintenance of natural balance, in the context of sustainable development.

In the 21st century, water has economical, social, political and cultural value. The on-going rise of world population and the increasing needs have also an effect on the value of water.

Water issues are multi-dimensional including economical, social, political and cultural aspects. The United Nations Millennium Declaration adopted the goal of reducing by half the proportion of people without access to safe drinking water by the 2015. An additional goal was set at the World Summit on Sustainable Development in Johannesburg to reduce by half the proportion of people without access to basic sanitation by 2015.

In this respect, The 5th World Water Forum will be a platform convening a wide range of stakeholders and strengthening commitments towards the achievement of these goals.

The main theme of the 5th World Water Forum is ‘Bridging Divides for Water’. The theme implies not only the specific geographical location of Istanbul, but also the barriers between modern age and traditional water cultures, water uses between rich and poor and between developed and developing regions of the world.

Water problems are region specific. However, there are several common solutions. We have prepared this country report in order to contribute to the understanding of the diversity and complexity of the issues on water management.

As Turkey is a developing country, the water resources must be developed in an efficient way which optimizes water’s benefits - more crop per drop-, while minimizing negative environmental impacts.
The availability of water per capita per year in Turkey is only about one fifth of that of the water rich countries. It is therefore imperative that Turkey should improve per capita water availability in order to enhance the quality of life of her people. Therefore, in recent decades, Turkey has made great success in water resources development for domestic use, irrigation, power generation, flood control, and other purposes.

Turkey has keen to apply internationally agreed principles and to act in accordance with the requirements of environmental and social impact assessment reports in the interest of the preservation of ecosystems, biodiversity and sustainable water resources management. Following the Rio Summit, Turkey has taken important steps such as enacting legislation and making policy commitments to protect the environment. The National Environment Strategy and Action Plan, the National Strategy and Action Plan on Biological Diversity, as well as other national legislation and international conventions are the main documents guiding the policies and implementations in Turkey.

It is our hope that this report will contribute to the understanding of the complex issues of applying global values for sustainable development to local conditions, challenges, and resources, by stimulating the reader to investigate further how Turkey interacts with its natural environment in order to improve the quality of life of her people.

H.E. Prof. Dr. Veysel Erğlu

Minister of Environment and Forestry
CHAPTER 1 - GENERAL ASPECTS

1.1 Physical Context and Geography

Turkey extends for almost 1650 km from west to east. It lies between 36°N and 42°N latitudes and between 26°E and 45°E longitudes. A small part of the country is geographically located in Europe, Thrace. The rest of the country, Anatolia or Asia Minor, is in Asia.

Figure 1.1 Map of Turkey

Turkey, with a total area of 780,000 km², is surrounded by the Black Sea, Bulgaria in the north, the Aegean Sea and Greece in the west, the Mediterranean Sea, Syria and Iraq in the south, Iran in the east and Armenia and Georgia in the north-east (Figure 1.1). The total length of border and coastline is 10,765 kilometers, of which 7,816 kilometers are coastlines.

Most parts of the country are of the mountainous characteristics, except for Central and South-Eastern Anatolia.

Turkey has a unique geographical and cultural position at the crossroads between Europe and Asia. Its historical and cultural links with the people of the Balkans, Caucasia, Central Asia,
Middle East and North Africa give a special geo-political significance. Hence, it is called as a “cradle of civilizations” and “bridge between the continents”.

1.2 Demographic Structure

The first census after the foundation of the Republic was conducted in 1927, the second in 1935 and then every 5 years until the last census in 2008 and the population was found about 71,5 million.

The rate of population growth considerably increased after the year 1967. While the population of Turkey has steadily grown, the rate of population growth has decreased from 2,52% to an annual rate of 1,31% since the turn of the century.

![Figure 1.2 Distribution of age](image)

The majority of the population consists of younger people and children (Figure 1.2). 66,5% is in the 15-64 year range. Average life span has increased over the past century to 71,7 years.

The rural population ratio decreased from 80% in 1927 to 29,5% in 2007. Approximately ¾ of the population lives in urban areas. The most crowded cities are Istanbul (12,5 million), Ankara (4,5 million) and Izmir (3,7 million). The average population density of Turkey is 92 persons per km². The urban population started to increase after the 1950s because of the intensive migration from the rural areas to the urban centers. The average number of person per household is 3,9 in Turkey.
1.3 Economic Indicators

Economical indicators of Turkey are given below:

Table 1.1 Economical indicators

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Population (2008, million)</td>
<td>71.5</td>
</tr>
<tr>
<td>GDP (billion US Dollar, current prices)</td>
<td>656.8</td>
</tr>
<tr>
<td>Per capita GDP (US Dollar)</td>
<td>9305</td>
</tr>
<tr>
<td>GDP growth rate (%)</td>
<td>4.6</td>
</tr>
<tr>
<td>GDP by main sectors</td>
<td></td>
</tr>
<tr>
<td>Agriculture</td>
<td>8.9</td>
</tr>
<tr>
<td>Industry</td>
<td>26.8</td>
</tr>
<tr>
<td>Construction</td>
<td>6.5</td>
</tr>
<tr>
<td>Trade</td>
<td>15.2</td>
</tr>
<tr>
<td>Others</td>
<td>42.6</td>
</tr>
</tbody>
</table>
CHAPTER 2 - WATER AND LAND RESOURCES

2.1 Climate

The climate of Turkey is semi-arid with some extremities in temperature (Figure 2.1). Climate and precipitation figures exhibit great variance throughout the country: in the higher interior Anatolian Plateau, winters are cold with late springs, while the surrounding coastal fringes enjoy the very mild-featured Mediterranean Climate. Average annual precipitation is 643 mm, ranging from 250 mm in the Central Anatolia, to over 2500 mm in the coastal area of north-eastern Black Sea. Approximately, 70% of the total precipitation falls during the period between October and April, and there is a little rainfall during summer months.

![Figure 2.1 Aridity assessment of Turkey based on P/PET relation](image)

Due to the variation in topography, three main climate zones are observed in the country, namely mediterranean, sub-tropic and terrestrial.

Three types of rainfall are observed in Turkey: the convective rainfall in Central Anatolia during spring and summer months, the frontal rainfall in all regions, mainly in winter and spring months, and the orographic rainfall on the seaward slopes of the Black Sea and the Mediterranean Sea.

The average annual temperature varies between 15°C and 20°C on the coastal zones, falls to 4°C and 18°C in the inland areas. The mean temperature for the 1941-2007 climatic periods is about 13°C and has an increasing trend of 0.64°C/100 years (Figure 2.2).
2.2 Water Resources

Geographically, there is a large variation in annual precipitation, evaporation and surface run-off parameters, in Turkey. Precipitation is not evenly distributed in time and space throughout the country. There are 25 hydrological basins in Turkey (Figure 2.4). The rivers often have irregular regimes.
Turkey has 25 basins

Figure 2.4 Hydrological basins

The elements of annual water budget of Turkey are illustrated in Figure 2.5. The given water budget is calculated from the data of the years 1935 and 2008.

Considering the average surface water run-off which is 186 billion m$^3$/year with the surface run-off of 7 billion m$^3$/year coming from neighboring countries, the total surface run-off within the country reaches to the amount of 193 billion m$^3$/year. On the other hand, the average amount of ground-water leakage is 41 billion m$^3$/year. However, not all the renewable water resources can be utilized because of economic and technical reasons. Exploitable portions of surface run-off including inflow from bordering countries, and groundwater are 98 and 14 billion m$^3$/year, respectively. Thus, the total of economically exploitable water resources potential amount to 112 billion m$^3$/year.

The 25 hydrological basins in Turkey have a total surface water run-off of 193 billion m$^3$/year. 31% of the potential is constituted by the Euphrates (Fırat) and the Tigris (Dicle) Rivers both of which have their sources in the eastern part of the country.
Mean Annual Precipitation Volume
501 billion m$^3$

- Evaporation: 274 billion m$^3$
- Surface Run-off: 186 billion m$^3$
- Leakage to Aquifers: 41 billion m$^3$
- Surface Water Potential: 98 billion m$^3$
- Groundwater Potential: 14 billion m$^3$
- Total Exploitable Water: 112 billion m$^3$
- Actual Consumption: 46 billion m$^3$

**Figure 2.5 Annual water budget in Turkey**

The distribution of mean annual precipitation is shown in Figure 2.6. As seen in this pie graph, the amount of evapotranspiration is relatively high, with a ratio of 55%.

**Figure 2.6 Distribution of precipitation.**
Taking into consideration the population of 2007 which is 70.6 million, the quantity of water per capita per year is 1,586 m³. Countries regarded as being rich in water resources have 8-10 thousand m³ water per capita per year. The available water per capita per year in Turkey is about 1/5 of the water-rich countries. It should be noted that Turkey, contrary to the prevailing belief, is not a water-rich country. Furthermore Turkey is not the richest country of the region in terms of water resources (Figure 2.7). The available water per capita in Turkey is less than the world average. Furthermore, it is estimated by the experts that, in 2023, the amount of available water will likely to be less than 1000 m³/capita/year.

![Figure 2.7 Water availability in the World](image)

**Figure 2.7 Water availability in the World**

### 2.3 Land Resources

The total surface area of Turkey is 77.95 million ha (mha). The total agricultural land in the country, almost one third of the total surface area can be classified as arable land. Under the available technology, 8.5 mha area is estimated to be economically irrigable. Statistics related to land resources of Turkey is given in Table 2.1.
### Table 2.1 Land resources of Turkey

<table>
<thead>
<tr>
<th>Land Resources</th>
<th>(mha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turkey’s Surface Area</td>
<td>77,95</td>
</tr>
<tr>
<td>Arable Land</td>
<td>28,05</td>
</tr>
<tr>
<td>Rainfed Agriculture</td>
<td>17,00</td>
</tr>
<tr>
<td>Economically Irrigable</td>
<td>8.50</td>
</tr>
<tr>
<td>Currently Irrigated</td>
<td>5.28</td>
</tr>
</tbody>
</table>

**Figure 2.8 Irrigated area and rainfed agriculture**
CHAPTER 3 - WATER MANAGEMENT

Comprehensive water planning activities have been carried out in Turkey since the 1950s. These have led to the construction of structures on rivers to regulate the flow and to meet the energy and food requirements of a growing population while achieving socio-economic development goals.

The main approach for the integrated water resources management is to manage them in a sustainable way in the basin scale. In this context, Turkey has taken great strides in sustainable water management. Turkey’s water management policies are directed towards satisfying the increasing demand for domestic water supply, achieving food security, generation of energy, and conserving the environment in accordance with international standards.

3.1 Legal and Institutional Framework

The integrated approach to water resources management provides a framework for linking policy dialogue, legislation, structural reforms and the use of economic instruments, technical interventions, environmental management and social concerns at a variety of levels.

Legal and institutional frameworks are considered to be key determinants of successful water management. They are part and parcel of each other. It is clear that the more coherent they are, the better the solution we achieve.

In Turkey, water-related activities are centrally planned. Water resources management is described in the five year development plans specifying the general principles and priorities of the implementation of medium and long term economic, technical, environmental, social and cultural policies.

The institutional framework has three levels: decision-makers, the executive level and end users.

The Prime-Ministry, related Ministries and the State Planning Organization are the decision-makers. Governmental institutions make up the executive level. They have a two-tiered organization. The top management level is the office of the General Directorate of the State Organizations in Ankara, which has a number of different departments. The second management level consists of their regional directorates or provincial directorates throughout the country. At
the user level, there are both governmental and non-governmental organizations for the operation and maintenance of the projects.

3.1.1 Legal framework

As for legislation in the water sector, Article No.168 of the Turkish Constitution on the “Exploration and Management of Natural Wealth and Resources” states that natural assets and resources are at the disposal of the government and that the authority to explore and manage such wealth and resources is vested in the government. The government may, however, delegate its rights to legal and real persons for some period of time.

Within this content, the Turkish Civil Code (CC) has grouped water resources into the two categories:

a) Public Water Resources

These are water resources out of the domain of private proprietorship and under the rule and disposal of the state. Their management and utilization are to be provided by means of public law.

There are several regulations on water issues some of which are stated below;

Law No. 167 on Groundwater came into force in 1960. According to the Law, groundwater is under the control and ownership of the government. The Law deals primarily with research, allocation, utilization, protection and registration of groundwater.

Law No. 1053 on Potable, Utility and Industrial Water Supply in Ankara, Istanbul and Cities with a Population over One Hundred Thousand” gives the DSI the responsibility to supply domestic and industrial water for cities with a population of over 100,000. According to an amendment made in 2007, the DSI General Directorate has been authorized to supply domestic and industrial water to the 3,225 settlements with municipal administrations.

Law No. 2872 on the Environment was first enforced in 1983 and amended in 2006. It deals with the following three main ideas areas:

- the general principles for environmental protection and the prevention of pollution;
- the measures and prohibitions related to environmental protection, and
the imposition of administrative penalties on polluters who cause the quality of groundwater to deteriorate.

In the content of the Law on the Environment, a By-Law on Water Pollution Control has been prepared. The aim of the by-law is to protect water quality and to determine legal and technical matters for the prevention of water pollution in accordance with the principle of sustainable developments.

b) Water Resources in the Domain of Private Law and Private Proprietorship

These are water sources and springs regarded as an inseparable part of the territory in which they are located and, as such, under the proprietorship of private persons. Rights of ownership and use of such waters are set out in the CC and are subject to title deed registration (CC, A 674).

3.1.2 Institutional framework

There are several organizations involved in water-related issues. The organizations are as follows:

- Development Plans are prepared by the State Planning Organization.
- Law No. 6200 on the Organization and Duties of the General Directorate of the State Hydraulic Works was enacted in 1954. The DSI, as a competent water authority, is the main organization responsible for water resources management. All water resources are managed in accordance with Law No. 6200. The DSI was established for the purpose of preventing damage caused by surface water and groundwater and ensuring the utilization of water resources for multiple purposes.
- The Ministry of Environment and Forestry was established to take the necessary measures to protect the environment and prevent environmental pollution in accordance with the Law No. 4856.
- The General Directorate of the Electrical Power Resources Survey and Development Administration is responsible for surveys related to electric power and for the rational use thereof.
- Special Provincial Administrations (SPA) work under the auspices of provincial governors (Law No. 5302). The responsibilities of SPA related to water issues include supplying potable water to rural communities.
The Bank of Provinces, an affiliated institution of the Ministry of Public Works and Settlements, is responsible for urban planning, public works and drinking water supply for municipalities in accordance with the Law No. 4759 on the Bank of Provinces.

Metropolitan municipalities have their own authorities in accordance with Law No. 5216 on metropolitan municipalities. Within their territorial borders, these municipalities are to ensure the protection of water basins in harmony with the principle of sustainable development.

Law No. 2560 on the Establishment and Duties of the General Directorate of the Istanbul Water and Sewage Administration sets out the authorities of the Istanbul Water and Sewage Administration. Water and sewage administrations (within the border of all metropolitan municipalities) are responsible for taking legal, technical and administrative measures to preserve water and prevent water pollution.

The Ministry of Agriculture and Rural Affairs is responsible for making investigations and preparing projects to protect and improve soil, water, plant, animal and fisheries resources and products, to control wastewater discharges into fish production areas, and to monitor nitrates parameters in freshwater and groundwater in accordance with Decree-Law No. 441.

The Ministry of Health is responsible for determining quality standards for drinking water and water for consumption, monitoring these standards and preparing legislation in these areas.

The Ministry of Foreign Affairs is involved in all issues related to transboundary waters.

3.2 Water Use

Water safety has recently become a major concern for many countries. The Millennium Development Goals (MDGs) adopted the goal of reducing by half the proportion of people without access to safe drinking water by the 2015. In line with the MDGs water and sanitation issues, efforts are being made to manage and ensure the efficient use of water, especially for sustainable development.

Water resources are allocated to the various sectors by the DSI in line with an integrated water resources management approach. Figure 3.1 shows water potential and consumption by basins for 2008.
Turkey gives great importance to integrated regional development projects. The Southeastern Anatolia Project (GAP), Eastern Anatolia Project (DAP) and Konya Plain Project (KOP) can be mentioned among them.

As shown in Figure 3.2, only 41% of total exploitable water potential of the country has been consumed until now. It is planned that remaining part would be developed by 2023 which is the 100th Anniversary of Turkish Republic.

In various sectors, as 34 billion m$^3$ in irrigation, 7 billion m$^3$ in domestic water supply and 5 billion m$^3$ in industry totally 46 billion m$^3$ of water was consumed in 2008. This sum corresponds
to only 41% of the available exploitable potential of 112 billion m³. According to future projections, the share of irrigation use will decrease from 74% in 2008 to 64% by 2023. On the other hand, the domestic and industrial use would increase to 16% and 20% in this period, respectively (Figure 3.3).

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
<th>2023</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irrigation</td>
<td>34 billion m³ (74%)</td>
<td>72 billion m³ (64%)</td>
</tr>
<tr>
<td>Domestic water</td>
<td>7 billion m³ (15%)</td>
<td>18 billion m³ (16%)</td>
</tr>
<tr>
<td>Industry</td>
<td>5 billion m³ (11%)</td>
<td>22 billion m³ (20%)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>46 billion m³</td>
<td>112 billion m³</td>
</tr>
</tbody>
</table>

Figure 3.3 Actual water consumption and projection for 2023

The water requirement increases steadily and the agricultural sector is the major consumer of water in Turkey with about 34 billion m³/year while the water volume to be utilized by this sector would be expected at the level of 72 billion m³/year by 2023.

Regarding groundwater, exploitable groundwater resources of Turkey are 13.66 billion m³/year excluding the discharge of springs feeding surface water resources.

At present, 90% (12.42 billion m³/year) of the groundwater reserve has been allocated, 55% (6.77 billion m³/year) of which is for irrigation (including private use of 2.74 billion m³/year) and 45% (5.65 billion m³/year) is for domestic and industrial purposes.

3.3 Dams and Hydroelectric Power Plants (HEPPs)

Main activities in dam construction accelerated after 1954 with the establishment of the DSI, subsequent legislation and establishment of regional administrations continued to spur dam
development in the second half of the 20th Century. The environmental concerns are the one of the reasons for slowing the progress in dam construction activities in the country.

The first dam built during the republic era is the Cubuk-I Dam the main purpose of which is to meet the domestic water requirement of the city of Ankara. No serious activities in dam construction were observed until the end of Second World War except for a few small dams built for irrigation purposes. The largest multi-purposes dam constructed in Turkey is Atatürk Dam (Figure 3.4). Comparing with the reservoir capacity, Atatürk Dam is 8600 fold larger than Çubuk-I Dam.

![Figure 3.4 Atatürk Dam and HEPP](image)

According to the standards of ICOLD (International Committee on Large Dams), the dam is classified as a “large dam”, if its height from foundation is more than 15 m, or its reservoir volume is equal or more than 3 hm°. As seen from the Table 3.1, a total number of 673 large dams were constructed in Turkey. The total reservoir capacity of 260 large dams is about 140 km°.

**Table 3.1 Development of dams as of 2008**

<table>
<thead>
<tr>
<th>Dam type</th>
<th>In Operation</th>
<th>Under Construction or in Program</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Total</td>
</tr>
<tr>
<td><strong>Dam</strong></td>
<td>673</td>
<td>146</td>
</tr>
<tr>
<td>(Large-Scale Water Projects)</td>
<td>260</td>
<td>63</td>
</tr>
<tr>
<td>(Small-Scale Water Projects)</td>
<td>413</td>
<td>83</td>
</tr>
<tr>
<td>Small Dams</td>
<td>657</td>
<td>44</td>
</tr>
</tbody>
</table>
Dams in Turkey can be classified as follows according to crest types:

- Rock or earth-filled types: 650 dams
- Concrete gravity types: 8 dams,
- Arch types: 6 dams
- Composite (Concrete Faced Rock - Fill Dam - CFRD or RCC) types: 9 dams

Owing to considerable variation observed in the run-off in terms of seasons, years and regions, it is absolutely necessary to have water storage on the rivers in Turkey. This ensures access to water when it is necessary. Construction of the dams in Turkey is not only for irrigation and hydropower production, but also for the long term domestic water supply. Consequently, Turkey has prioritized the construction of water storage facilities.

Resettlement Policy and Practices

The resettlement of families that are adversely affected by infrastructure projects is regulated by the Resettlement Law in Turkey, which provides for state-assisted resettlement in both rural and urban areas. Resettlement action plans are prepared according to international standards, with the goal of minimizing the negative effects of resettlement and ensuring the maintenance of the current living standard and rehabilitating the income of the people living in the project area.

While expropriation compensation payments are granted to all individuals properties, government assistance in resettlement is given to households rather than individuals. Families engaged in agriculture are resettled in rural areas, while families not engaged in agriculture are resettled in towns and cities.

3.3.1 Hydropower potential

Hydropower is a renewable form of energy since it uses the power of flowing water, without vested or depleting it in the generation of energy. Because they are clean energy generation plants hydropower can contribute to reducing air pollution and slowing down global warming. Any other air pollutants or toxic wastes are not produced and it promotes energy safety independence and price stability. Hydropower is an electricity sources with long viability and low operation and maintenance (O&M) cost.

Turkey’s theoretical hydroelectric potential is 1% of that of the World and 16% of Europe. The gross theoretical viable hydroelectric potential in Turkey is 433 billion kWh and the technically viable potential is 216 billion kWh. The economically viable potential, however, is 140 billion kWh (Figure 3.5)
Currently, Turkey has 172 hydroelectric power plants in operation with total installed capacity of 13,700 MW generating an average of 48,000 GWh/year, which is 35% of the economically viable hydroelectric potential. 148 hydroelectric power plants are under construction 8,600 MW of installed capacity to generate average annual 20,000 GWh representing 14% of the economically viable potential. In the future, 1,418 more hydroelectric power plants will be constructed in order to make use of additional 22,700 MW installed capacity. As a result of these works, a total of 1,738 hydroelectric power plants with 45,000 MW will tame rivers to harness the economically viable hydropower of Turkey.

Annual energy consumption per capita in Turkey has reached 2,900 kWh which is above world average of 2,500 kWh. The average energy consumption for the developed countries is 8,900 kWh, but it varies from 12,322 kWh in the USA to 827 kWh in China. Annual increase in energy consumption is 8-10% in Turkey except for the recession years.

Total energy generation in Turkey in the 1950s was 800 GWh, this figure has increased by about 256 times, reaching 191,555 GWh/year today. As of 2008, the current installed capacity is 42,359 MW, which could generate an average of 246,974 GWh/year. Capacity utilization has been 87% in thermal plants and 70% in hydroelectric power plants. 19% of energy generation depends on hydroelectric power and the remaining 81% on thermal power. A special emphasis has recently been placed on alternative energy sources such as wind and geothermal power. The
share of geothermal and wind power in total energy generation has reached 2%. There have been some steps taken towards introducing the use of nuclear power as well.

Table 3.2 Status of economically viable potential of HEPPs

<table>
<thead>
<tr>
<th>Status of Economically Viable Potential</th>
<th>Number of Hydro-Electric Power Plants</th>
<th>Total Installed Capacity (MW)</th>
<th>Average Annual Generation (GWh/year)</th>
<th>Ratio (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>In Operation</td>
<td>172</td>
<td>13,700</td>
<td>48,000</td>
<td>35</td>
</tr>
<tr>
<td>Under Construction</td>
<td>148</td>
<td>8,600</td>
<td>20,000</td>
<td>14</td>
</tr>
<tr>
<td>In Program</td>
<td>1,418</td>
<td>22,700</td>
<td>72,000</td>
<td>51</td>
</tr>
<tr>
<td>Total Potential</td>
<td>1,738</td>
<td>45,000</td>
<td>140,000</td>
<td>100</td>
</tr>
</tbody>
</table>

Energy project with in the content of Law 4628

For the realization of the hydroelectric energy projects, DSI requested from the Grand National Assembly of Turkey to prepare a law so that private sector can invest for the realization of project for shorter period than DSI. This law is called “4628 Electricity Market Law” and its licensing regulation which comply with the free market economy. This agreement also defines the procedures and principles of water uses together with the other user’s rights.

“4628 Electricity Market Law” has become effective in 2001. The first article of this law defines the objective, which is to supply electricity to the users in adequate quantity, in high quality, continuously and compatible with the environment by providing financially strong stable and transparent and competitive electricity market complying with the special law rules and independently controlled.

Within the framework of the “4628 Electricity Market Law”, regulation related with the procedures and principles of signing Water Use Right Agreement for production activities in electricity market was prepared in 2003, and private sector applications according to this regulation has started since then.

In total 1524 hydroelectric power projects with 22360 MW installed capacity has been implemented until January 22, 2009. However, 426 projects have been granted with licensing, and out of this number, construction of 135 projects has been started.
3.4 Domestic and Industrial Water Supply

Domestic and industrial water needs are provided by the same distribution network and both have the same quality (Figure 3.6)

3.4.1 Domestic water supply

The authorities responsible for domestic water supply are the DSI, the Bank of Provinces, Municipalities and the SPA. By the end of 2008, 7 billion m$^3$ of domestic water is supplied to cities and rural areas according to the drinking water standards (Table 3.3). Domestic water supply projects are developed by the above mentioned organizations, whereas the operation and maintenance activities are carried out by municipalities and village authorities.

![Figure 3.6 Domestic water treatment plant and supply system](image)

Domestic water treatment plants are designed and constructed in accordance with the European standards. The capacities of the treatment facilities constructed vary between 1.600.000 m$^3$/day and 50.000 m$^3$/day depending on the population of the cities.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total water use</th>
<th>Domestic water use</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>million m$^3$</td>
<td>%</td>
</tr>
<tr>
<td>1990</td>
<td>30,600</td>
<td>27</td>
</tr>
<tr>
<td>1999</td>
<td>38,900</td>
<td>35</td>
</tr>
<tr>
<td>2002</td>
<td>39,300</td>
<td>36</td>
</tr>
<tr>
<td>2008</td>
<td>46,000</td>
<td>41</td>
</tr>
<tr>
<td>2023*</td>
<td>112,000</td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Total water use</th>
<th>Domestic water use</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>million m$^3$</td>
<td>%</td>
</tr>
<tr>
<td>1990</td>
<td>30,600</td>
<td>27</td>
</tr>
<tr>
<td>1999</td>
<td>38,900</td>
<td>35</td>
</tr>
<tr>
<td>2002</td>
<td>39,300</td>
<td>36</td>
</tr>
<tr>
<td>2008</td>
<td>46,000</td>
<td>41</td>
</tr>
<tr>
<td>2023*</td>
<td>112,000</td>
<td>100</td>
</tr>
</tbody>
</table>

(* projected)
Average annual domestic water supply amount per person was 98 L/day in the 1980s, 195 L/day in the 1990s whereas; today this amount is 250 L/day. Because the climate change threatens sustainable use of the resources, efficient use of water is necessary so that next generations would not suffer from water shortages. For this reason, Turkey aims to save water by reducing the daily use to 150 liters per person per day through the application of modern techniques.

As of 2008, the water supply and treatment plant projects of 14 cities are being operating by related municipalities. Annual 2.2 billion m³ of water volume is treated in these treatment plants in accordance with the European standards.

Table 3.4 Industrial water use

<table>
<thead>
<tr>
<th>Year</th>
<th>Total water use million m³</th>
<th>%</th>
<th>Industrial water use million m³</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>30,600</td>
<td>27</td>
<td>3,443</td>
<td>11</td>
</tr>
<tr>
<td>1999</td>
<td>38,900</td>
<td>35</td>
<td>4,000</td>
<td>11</td>
</tr>
<tr>
<td>2002</td>
<td>39,300</td>
<td>36</td>
<td>4,200</td>
<td>11</td>
</tr>
<tr>
<td>2008</td>
<td>46,000</td>
<td>41</td>
<td>5,000</td>
<td>11</td>
</tr>
<tr>
<td>2023</td>
<td>112,000</td>
<td>100</td>
<td>22,000</td>
<td>20</td>
</tr>
</tbody>
</table>

Provision of Safe Drinking Water and Sanitation

In general, 83% of the population (urban 94%, rural 62%) of Turkey has access to improved sanitation, including the households at least having connection to public sewer, septic system or simple pit latrine. 40.2% of total population is served by wastewater treatment plants. 78.4% of total municipal population is connected to a sewer system. The other municipalities lack a treatment system or have only primary (physical) treatment, or they lack the capacity to operate the established sewage treatment plants.

3.4.2 Industrial water use

Industrial water use is about % 11 of total water use (Table 3.4). Surface water is the main supplier for industry. Considering the industrial structure in Turkey, the manufacturing industry has the most important sub-industries. The water need for the manufacturing industry in the Marmara Region compared with the other regions in Turkey is at the highest level. As of 2008, the greatest industrial water use was in the region, highly industrialized as well as urbanized region which account for 18% of the total industrial water use. The largest metropolitan cities such as Istanbul, Bursa and Kocaeli are located in the region.
3.5 Agricultural Water Use

3.5.1 Agricultural sector and its role in the economy

The agricultural sector has been the largest sector in terms of employment, and a major contributor to the country’s gross national product (GNP), exports and industrial growth. However, the GNP share of the agricultural sector declined from 25% in 1980s to 11% in 2007. The main components of the agricultural GNP are crops, forestry, livestock and aquaculture.

The Turkish agricultural policy is set out in successive five-year development plans. The development plans are mainly focused on stabilizing agricultural prices, providing adequate and stable income for those working in agriculture, meeting the nutritional needs of a fast-growing population, increasing yield, minimizing vulnerability of production due to weather conditions, promoting development in rural areas, promoting the application of modern agricultural techniques and developing an export potential for agriculture. The expansion in agricultural exports within the last decade is a consequence of this planning process.

In the recent years, farmers’ preferences on crop pattern are identified as follows; maize, cereals, cotton, fruits and vegetables. Turkey is the largest producer and exporter of agricultural products in the Near East and North Africa region. Turkey produces 80 kinds of fresh fruit and vegetables out of which 50 kinds are exported. Most of the agricultural products come from the irrigated farming. Lower Seyhan in Çukurova Plain is one of the earliest developed irrigation project.

Figure 3.7 Lower Seyhan Irrigation Project
3.5.2 Development and management of irrigation in Turkey

Total amount of economically irrigable land is 8.5 mha. As of 2008, 5.28 million hectare of economically irrigable land has been equipped with irrigation facilities. By 2023, 8.5 mha land has been intended to be developed.

Figure 3.8 Irrigation systems

Approximately 92% of total area is irrigated by using surface irrigation methods such as furrow. The remaining part is irrigated with pressurized irrigation methods like sprinkler and drip (Figure 3.8).

The O&M activities were carried out by the governmental organizations till the early 1990s. The governmental organizations are entitled to transfer the operation and maintenance of irrigation systems to Water User Organizations (WUOs) such as village administrations, municipalities, cooperatives, and Water User Associations (WUAs). The government has had a program to transfer of O&M responsibility for secondary and tertiary canals to WUOs. However, by 1993, DSI was only able to transfer of O&M irrigation systems of some 70,000 ha to various types of WUOs. In order to perform O&M of irrigation and drainage infrastructures more efficiently and ensure farmers’ participation, this process has gained momentum since 1993.

Presently, 96% of all irrigation networks are operated and maintained by the WUOs. The irrigation management transfer has been supported by the World Bank. The programme of Turkey in this regard, is used as a best practice to developing countries how irrigation management transfer could be accomplished. Turkey has been shown as a good example considering the implementation of transfer to the other developing countries.
3.5.3 Water for food, poverty eradication and rural development

Agriculture can play a role in alleviating general poverty, since the agricultural sector makes a significant contribution to overall economic growth through its linkages with other sectors of the economy. It also contributes indirectly to alleviating rural poverty because it influences the non-farm rural economy.

![Figure 3.9 Groundwater irrigation in a greenhouse](image)

Especially in the rural areas, groundwater irrigation schemes have an important role. Groundwater irrigation to the farmers is provided by irrigation cooperatives. All irrigation schemes (groundwater boreholes, pumps, electrification unit, irrigation systems) are constructed by the government. Operation and maintenance responsibility of the schemes is transferred to the cooperatives namely farmers. All the investment costs are financed by the government and are refunded in 15 years by farmers without any interest. Also, groundwater is allocated to individual farmers for irrigation free of charge. It leads to increasing of income in rural areas. Therefore, it is expected that migration to big cities is prevented through groundwater irrigation schemes.

3.6 Public Participation

3.6.1 Through irrigation

Operation and maintenance responsibilities of irrigation schemes are transferred to WUOs such as village administrations, municipalities, cooperatives, and WUAs. Turkey is one of the world leaders in development of WUAs, and in transfer of irrigation schemes to these users groups for
O&M. The WUAs have been established through the existing local government structures. In this way, this process has enabled for farmers’ participation efficiently in irrigation management.

### 3.6.2 Through EIA process

Participation of all stakeholders to development activities both in the planning and operation stages, especially to those of water resources, is of high importance. Environmental Impact Assessment (EIA) studies are an effective way of encouraging public participation in projects at the planning stage. According to EIA Regulation enacted in 1993 and amended in 2008, for every new activity, an EIA report has to be prepared and approved by the Ministry of Environment and Forestry. During the investigation-evaluation stage of EIA reports, a public participation meeting is organized. All the local people are invited to this meeting to state their opinions on the project and their opinions affect the final decision about the project. If most of the local people are against the project, it may be rejected and revised to reflect the public opinion.

### 3.7 Risk and Disaster Management

#### 3.7.1 Flood management

Flood is a natural phenomenon however human beings convert it to a disaster. Human interference such as dumping domestic and industrial wastes to the river beds, improper designs and construction of some structures in the river bed cause floods (Figure 3.10). Removing sand and gravel without license also causes river bank erosion. Deforestation and intervention to upstream are accelerating erosions and raising the flood damages in downstream.

![Figure 3.10 Flood disaster by human interference](image-url)
Flood is the second biggest hazard in Turkey (Figure 3.11), which causes huge economic loss after earthquake. According to the records based on annual flood inventory studies, economic loss related to the flood disasters reaches 100 million US$/year and in the last 15 years, about 500,000 ha urban and agricultural areas were affected by floods. From this point, geographical, meteorological and physical characteristics as natural effects and human activities as socio-economic effects constitute the sensitivity level of Turkey to flood risk.

Flood disaster management should involve both flood management and risk management. Flood management activities consist of three levels as such before, during and after the flooding. Last decade's flooding events with their costly results have brought Turkey to a new view-point to reduce and control the susceptibility to the flood damages, namely the "Hazard Mitigation Approach". It is well known that, specific measures for the flooding hazards can not be implemented or evaluated independently, owing to the complex nature of the hazard mitigation. In this regard, it can be concluded that building a flood control structure is neither the best solution nor the only solution to a flood problem.

Structural flood protection projects may be considered as one of the basic strategies that can reduce flood damages, and in this context flood protection planning should consider the full range of the hazard mitigation activities (Figure 3.12).
However the new approach in Turkey is the risk management to mitigate the hazards of the floods. Therefore the implementation of a flood forecasting and early warning system is being conducted in the framework of the Turkey Emergency Flood and Earthquake Relief (TEFER) project. The data transmission is taking place via satellite. The flood forecasting system takes real-time monitoring data of the regional meteorology and the catchment status, and produces forecasts of the flood state of the catchment.

New forecasting areas will be studied and after the feasibility study, the flood forecasting systems will be implemented. The new areas are Maritsa River, which will be a joint project with Bulgaria with the support of European Union (EU) funding, East Black Sea Region and Manavgat Creek.

### 3.7.2 Drought management

The precipitation-flow relationships changing seasonally also show considerable differences from year to year and natural water supply falls to minimum levels in summer time when the demands are maximum. Therefore, water management presents a vital importance for the purpose of meeting water requirements changing with time and place. Furthermore, the periodic droughts in the country cause important problems and necessitate the development of the projects for water storage to meet the demands in the drought periods.
Figure 3.13 Annual precipitation anomaly

Figure 3.13 indicates that precipitation has decreased in the recent years and drought periods occur every 16-18 years, periodically.

In this context, irrigation plans based on the river basins were prepared in order to minimize the effect of drought that we had in the past in particularly Marmara and Aegean Regions. Furthermore, to reduce the impact of drought on yield, studies on preventing the planting of crops which consume most water, determining the time that crops requires most water and giving the water to that crops at that certain time, and giving the priority to the crops that requires water most were carried on annually during the drought period.

In Turkey, 74% of the water resources are being used in irrigation sector. Therefore, in the drought period shortage in water supply in some proportions is very important for economical aspects. Although the demands (except the strategic ones) in the drought periods can be fully met technically by constructing storage reservoirs, this solution is not accepted as a rational solution economically and evaluated as waste of resources. In these periods the demands must be met by making shortages in water supply.

Due to its location in the Mediterranean Basin, Turkey will be one of the most affected countries by climate change, according to United Nation Water Report published in 1994. IPCC (Intergovernmental Panel on Climate Change) 4th Assessment Report states that annual amount of precipitation and the number of precipitation days are very likely to decrease and the risk of summer droughts is to increase in most of the Mediterranean Region.
CHAPTER 4 - WATER AND THE ENVIRONMENT

4.1 Environmental Legislation and International Conventions

Ever since the 1930s, legislation which is related either directly or indirectly to the environment has been in force.

Article 56 of the Turkish Constitution declares that “Everybody has the right to live in a healthy and well-balanced environment”. It rules that “The development of the environment, the protection of environmental health and the prevention of environmental pollution are the mission of the Government and the Citizens”. Turkey’s efforts to establish an organizational structure related to the environment began in the 1970s. An Environmental Problems Coordination Commission was established to facilitate coordination among the various governmental agencies concerned and the municipalities. Subsequently, the necessary organizations were established and legislation was enacted. In 1983, the Law on Environment was enacted. The Law on Environment is the starting point for other legal regulations directly related to the environment. It adopts the contemporary principle of “the polluter pays”. In 1991 the Ministry of the Environment was established. Later, it was reorganized as Ministry of the Environment and Forestry in 2003. The main responsibilities of the Ministry of the Environment and Forestry are as follows:

- the protection of the environment;
- the prevention of environmental pollution;
- identification of the principles and policies needed to improve the environment, and
- the preparation of environmental plans on the basis of rational use of natural resources, based on both economic and ecological requirements.

In general terms, the body of law related to water resources and the environmental protection has been developed spanning four key areas:

- Constitutional Mandates;
- Regulatory Law’
- Natural Resource Utilization Regulations, and
- Public Health Law.
Within the regulations, rules, directives, recommendations and decisions taken within the framework of the Environment Law, much work has been done on environmental protection in relation to activities which produce wastes.

One of the most important legal arrangements for the protection of the water resources is the “By-Law on Water Pollution Control”. The aims of the regulation can be summed up as follows:

- to protect ground and surface water potential with the aim of utilizing it;
- to identify principles for combating water pollution;
- to set out legal and technical norms for preventing the pollution, and
- to take measures at the technical and administrative levels to reduce sources of pollution.

Turkey is signatory to a number of international agreements which seek to protect water resources and the environment. Turkey takes measures to protect its lakes and wetlands and their habitats by implementing international conventions and national legislation (Figure 4.1). The Bern Convention, Basel Convention and Paris Convention are examples of conventions that Turkey has signed or ratified. Turkey is also a member of many international organizations involved in the protection of the environment including UNESCO, IUCN, WWF, NATUROPA (The magazine, published since 1968), FAO, IPGRI and UNDP.

![Figure 4.1 Wetlands from Turkey](image)

Turkey has been a party to the Ramsar Convention since 1993. In this context, a Wetlands Protection Regulation has been put into force. The regulation is the single regulation concerning wetlands protection. In the light of the provisions of the Convention, Lake Manyas, Lake Seyfe, Lake Burdur, the Sultan Reeds, the Göksu Delta, the Gediz Delta, the Akyatan Lagoon, Lake Ulubat and Lake Kızılırmak have been registered as Ramsar areas.
4.2 Water Quality and Pollution

Turkey is quite a young country in terms of its geological structures. Due to the topography, the rivers generally have unsteady flow regimes. Accordingly, water resources need to be controlled in order to regulate the flows. Together with the quantity of water resources, emphasis also needs to be placed on their quality. Water quality management has developed in a very progressive manner. Extensive regulations governing water quality management have been put into effect by means of the By-Law on Water Pollution Control. Two fundamental approaches have been adopted: first, the existing quality of water resources should be protected by considering water resources as an ecosystem, and secondly it is desirable to increase the water quality further to meet the country’s requirements.

4.2.1 Surface water quality

Within the framework of the By-Law on Water Pollution Control, regulations have been put into effect concerning protection zones around reservoirs used for domestic water supply, restrictions on the discharge of domestic and industrial waste water, and the protection of agricultural land.

The classification of surface water in line with the aims for which it is to be used has been carried out based on the criteria specified in the section of the regulation dealing with continental surface water classifications. The regulation defines four classes of water quality based on 45 parameters. The classification is as follows:

- Class I (high quality water) - to be used for domestic purposes;
- Class II (slightly polluted water) - to be used for domestic purposes after treatment;
- Class III (polluted water) - to be used after treatment depending on the intended use, and
- Class IV (heavily polluted water).

The quality of water resources in the river basins where agricultural and industrial activities take place intensively is between class II and class IV in terms of the classification defined in the By-Law on Water Pollution Control. For now, water resource quality is high in the basins where the most important tourism centers are located. The existing quality of these water resources should be kept as it is for the future.

A second regulation in the field of water quality management is the By-Law on Pollution Caused
by Dangerous Substances in Water and its Environment, which was put into force as a result of the transposition of the Dangerous Substances Directive and its daughter directives.

Finally, the EU Council Directive 91/271/EEC of 21st May 1991 has been transposed into Turkish legislation as the By-Law on Urban Waste Water Treatment. The purpose of this regulation is to protect the environment against the adverse effects of urban waste water collection, treatment and discharge, as well as the waste water discharge from certain sectors.

**4.2.2 Groundwater quality**

Although demand for groundwater is increasing, there is not much groundwater pollution as things stand. The main problem with groundwater relates to quantity rather than quality. Groundwater pollution is observed in some local areas. In general, this pollution is caused by domestic and industrial waste and agricultural chemicals and fertilizers. The pollution is mostly located within the areas of unconfined and karstic aquifers and the areas feeding the aquifers.

Some degradation is observed in the quality of groundwater in the Central Anatolia Region due to natural geological conditions. In the Aegean and Mediterranean Coastal Zones, there are some salinity problems due to the overexploitation of groundwater and the intrusion of saline water from the sea. On the other hand, direct or indirect discharge into groundwater is not allowed. This situation helps to protect groundwater against pollution.

**4.3 Marine and Coastal Ecosystems**

70-80% of all industrial products are supplied by coastal provinces. These conditions increase the stress on marine and coastal environments. A lot of measures necessary for the conservation of marine and coastal water quality have been taken with permanent effect through national, regional and international conventions, regulations and similar instruments (Figure 4.2).

There are many emergency response plans for pollution preparedness including Ship Emergency Response Plans, Coastal Facility Emergency Response Plans, Regional Contingency Plans and National Contingency Plans.

The Black Sea is a closed sea and the average salinity level is around 0.18%-0.19%. Due to the heavy rainfall and limited evaporation in the Black Sea Region, terrestrial water flows are high and
there is considerable surface water. The pollution load of the Black Sea is relatively high due to natural condition and the wastes of various countries carried by the rivers entering the Sea.

The Sea of Marmara has the same hydrodynamic characteristics as the seas to which it is lined by straits. The saturated oxygen content of the water below a depth of 25-30 meters is around 20%-30%, which creates problems for the dissolution of organic matter coming from shoreline discharges and the Black Sea.

Turkey has been monitoring the pollution in the Mediterranean and Aegean coastlines since 1975 under the Mediterranean Pollution Programme (MED POL) of UNEP/MAP. There are 95 parameters and 82 stations covering domestic and industrial discharges, river mouths and seas.

4.4 Special Water Bodies

Lakes, wetlands and deltas are of great importance, especially in terms of biological diversity and socio-economic environmental activities. More than 50% of the bird species in Turkey are migratory (Figure 4.3). The wetlands in Turkey are important for migrating birds as places where they can rest and feed. Among them, Manyas Bird Paradise is very famous one in Balikesir where 239 birds’ species are fed.
CHAPTER 5 - THE SOUTHEASTERN ANATOLIA PROJECT

The Southeastern Anatolia Project (GAP) is a regional development project aimed at the full fledged socio-economic development of the Southeastern Region of Turkey, known historically as Upper Mesopotamia, which has witnessed some of the earliest civilizations in the world. The GAP is the largest investment for regional development in the history of the Turkish Republic. It was originally planned in the 1970s to consist of projects for irrigation and hydraulic energy production on the Euphrates and Tigris Rivers, but transformed into a multi-sector social and economic development program for the region in the 1980s. As an integrated regional development project based upon the concept of sustainability, the GAP covers investments in such fields as urban and rural infrastructure, agriculture, transportation, industry, education, health, housing and tourism, as well as dams, power plants and irrigation schemes.

![Figure 5.1 The GAP project area.](image)

In 1989, with the transformation of the GAP to a multisectoral project with a master plan, the GAP Regional Development Administration (GAP-RDA) was established under Prime-Ministry. The core duty of the GAP-RDA is to plan and realize all efforts and activities geared to the development of the region in the context of a “comprehensive regional planning approach” that covers all economic and social sectors.

The project area lies in the Southeastern Turkey, covering nine provinces corresponding to approximately 10 percent of Turkey’s total population and an equivalent surface area. The project
area includes the watersheds of the lower Euphrates and Tigris Rivers and the upper Mesopotamian Plains. The water resources development program of the GAP includes 13 groups of irrigation and energy projects, seven of which are on the Euphrates River (Lower Euphrates - which is the largest and most comprehensive project including the Atatürk Dam and Şanlıurfa Tunnels together with five more subprojects within this framework-Karakaya, Euphrates Border, Suruç-Baziki, Kahta-Adıyaman, Gaziantep, Gaziantep-Araban) and six on the Tigris (Dicle-Kralkızı, Batman, Batman-Silvan, Garzan, Ilısu, Cizre).

Figure 5.2 Şanlıurfa Tunnel and Karakaya Dam

The GAP Region is endowed with a significant part of economically irrigable farming land and water resources of the country. Although the region has a significant potential for development in terms of population/resources balance, it still remains under average in terms of development indicators.

The great change which started with the GAP affects all sectors in the region economically and socially. This chain reaction triggered first by irrigation is expected to extend to industry and services presents significant opportunities for investment and development in many areas on the one hand while giving rise to new and urgent needs in social and physical infrastructure on the other. Both intensive migration and rapid population growth exert pressure on urban infrastructure services. The GAP-RDA seeks to develop and implement projects geared to the enhancement of the capacity of Municipalities to improve both rural and urban infrastructure.
The objectives of rural development in the GAP Region include raising the level of income in rural areas, providing inputs for industry, minimizing migration from rural to urban areas, generating employment and enhancing export oriented production.

The project includes 22 dams, 19 hydropower plants, and irrigation networks, on the Euphrates - Tigris River Basin. The total cost of the project is estimated as 37 billion TL, 21 billions of which (57%) have already been invested. Upon the completion of the project, 1.8 million hectares of land will be brought under irrigation, energy production in the region will reach 27,387 GWh, per capita income will rise by 209% and about 3.8 million people will be provided employment opportunities. The planned irrigation area corresponds to 21% of total irrigable land in Turkey and annual energy production to 20% of total electric energy potential in Turkey.

As a result of the completion of the activities and projects within the GAP Action Plan;

- The completion of the construction of 1,649 km. long main irrigation channels
- The opening up of 1,060,000 hectares of land to irrigated agriculture,
- The completion of 2,209 km. of national and county roads and many highway bridges reaching 2.8 km. in length,
- Reaching the targets of 50%, 100% and 90% of schooling, respectively in preschool, primary and high school education
- Creation of 3,580 additional bed capacities in health sector.
- Giving vocational training to 35,000 people, through an extended vocational qualification acquaintance training program.
- Reaching up to 6,200 people with training and consultancy programs in order to help them establish their own businesses,

are targeted.

The project rests upon the philosophy of sustainable human development, which aims to create an environment in which future generations can benefit and develop. The basic strategies of the project include fairness in development, participation, environmental protection, employment generation, spatial planning and infrastructure development. This massive development effort gives priority to economic, social and cultural advancement and well being of the whole country in general and of the people of the region in particular.

Since the ultimate aim of the GAP is to ensure sustainable human development in the region. Dams and other structures that have been erected so far or the ones that are still being
constructed form the physical infrastructure necessary for the economic growth, thus the results will provide better access to all sorts of services such as education, health and cultural activities, better shelters for the community and a clean and safe environment.

5.1 Irrigation in the GAP

Under the available technology, 8.5 million hectare of land is estimated to be economically irrigable in Turkey. In 2009, 62% of total irrigable area (5.28 million hectare) is irrigated. The GAP project covers 1.8 million hectare irrigable area which corresponds to 21% of economically irrigable land. The realization of irrigated area in the GAP is around to 15%.

The irrigation projects aims at the followings:

- To raise the income level in rural areas by enhancing agricultural productivity and diversifying farming activities,
- To provide sufficient inputs to agro-processing industries,
- To increase employment opportunities to minimize the drift of people out of the rural areas,
- To contribute to the production of exportable surpluses.
5.2 Hydroelectric Power in the GAP

The following pie chart displays the role of the GAP within the existing economical hydroelectric potential (140,000 GWh) in Turkey in terms of the hydroelectric generation today and in the future. The total installed capacity of power plants is 7,490 MW. The chart indicates that the GAP will have a considerable impact on the overall increase of hydroelectric power in Turkey where 20% of the approximately 27,387 GWh of hydroelectric generation is supplied by the power plants of the GAP project. The hydro energy realization ratio in the GAP project reaches 75% within the project itself.

Karakaya, Atatürk, Dicle, Kralkizi, Birecik, Karkamis and Batman HEPPs, all remaining within the GAP Region, have an important share in the total hydraulic energy production of the country. Starting from the operation of these facilities and up to the end of 2005, the total energy produced reaches 253 billion kWh.

İlisu Dam and Hydroelectric Power Plant, is one of the most important projects that will be realized in the context of the GAP. The Ilisu Dam is planned to be built on the Tigris River in Southeast Turkey, with a sole purpose of generating hydro-power. Once the lake of a dam is formed, all the water that flows through the turbines must carry on downstream because there is nowhere else for it to go. In addition the dam has no adverse effect on the quality of the waters of the Tigris River.

The project will benefit the people living in the region as well as the whole country. The dam will
lower the unemployment rate substantially and will provide higher living standards. The Ilısu Dam is of vital importance to Turkey's energy development scheme and to the general socio-economic development of the Southeastern Anatolia, which is Turkey's less developed region.

The project has been highly politicized and certain facts have been distorted. It is true that some of the settlements in the region will be flooded by the reservoir; however, it is Turkey's official policy to help resettle villagers as close as possible to their original homes. For this purpose, the competent Turkish authorities have committed themselves to conduct professional socio-economic surveys and a series of local public consultations to offer the choice of local resettlement or cash compensation and relocation support services to everyone to be affected by the dam.

![Figure 5.5 Comparison of hydropower in Turkey and the GAP area](image)

**Figure 5.5 Comparison of hydropower in Turkey and the GAP area**

### 5.3 The GAP, Social Development, Public Participation

There is no doubt that infrastructure investments and irrigation in the region will guarantee significant economic growth in the region. The crucial point, however, is to convert this physical economic growth into social welfare enjoyed by all. Consequently, the GAP approach to social development embraces a vision of democratic and participate social environment in the region, to ensure a fair sharing of the benefits of economic progress, and to promote human development. This approach is the common denominator in the design and implementation of all projects and thus special attention is paid to the disadvantaged sectors of the population (i.e. women, landless peasants and small farmers, the urban poor, children and youth) The basic idea is the elimination
of social dynamics that generate poverty and other factors that bar the access of poor people to the resources of the region.

As a large-scale endeavor targeting the elimination of regional development disparities and ensuring a balanced development, the GAPs success largely depends on sound information on the expectations of the people and ensuring their active participation to the process of development. Thus, social surveys and practices based on the findings of these surveys constitute a significant component of the GAP. In fact, the GAP Social Action Plan that focuses on sustainable development with popular participation was the direct outcome of earlier social surveys such as "Trends of Social Change", "Population Movements", "Status of Women and their Integration to the Process of Development" and "Resettlement and Employment of People Affected by Dam Lakes."

Public investments in the context of the GAP target are focusing on human beings for sustainable development. This principle relates to practices that create opportunities for the people in the project region to materialize their preferences and potential fully, fairly and in an equitable manner. Guided by policies and targets set out in the plan, the GAP Administration has since 1995 been setting up Multi-Purpose Community Centers (CATOM) to train local women and improve their status. In spreading CATOMs to different localities of the region there is cooperation with various governmental organizations as well as some international agencies.

As for public participation in the context of the GAP, the project related with the resettlement of people affected by Birecik Dam is one good example. This project was carried out in line with the social action plan. It is the one of first examples in Turkey of a comprehensive project implementation depending upon popular participation. The objective here is to help people affected by dam construction to resettle and adapt to their new environments in terms of economic activities, investments and employment and eventually reach the status of self-sustaining communities. To ensure people's active participation to the project, they were first informed about the nature of the project and a series of in-situ meetings were held. The people affected by the dam construction were informed about possible investment alternatives developed by economists and new alternatives were developed with the suggestions of the people. This significant project in which local people are actively involved in resettlement planning was carried out in cooperation with the United Nations Development Program (UNDP).
Social development programmes for youth, are also another example in the context of public participation. These programmes have the following objectives: Ensuring the participation of youth to the process of sustainable social and human development in the GAP Region; establishment of youth platforms; creating spaces for the cultural activities and social interaction of young people; organization of training programmes and strengthening the capacity of youth through training programs and social-cultural activities.

Other social projects undertaken by the GAP-RDA include "Rehabilitation of Children Working in Streets in Diyarbakır", "School Bussing Services" and youth related projects in Mardin.

5.4 The GAP and Environment

The Region of Southeastern Anatolia hosted many civilizations starting from pre-historic times. Rich with the cultural properties polytheist beliefs and three big faiths, the region can be considered as a "mosaic of religions" especially with the heritage of the provinces of Mardin, Sanliurfa, Sirmak and Siirt.

Since the GAP will instigate important changes in social and economic sectors both nationally and regionally, effects on environmental and cultural assets will be inevitable. It is another part of the GAP philosophy to consider positive and negative impacts of project implementation and to take measures in advance to curb negative ones while reaping the maximum from others.

Among specific activities and projects related to the protection of cultural properties important ones include the following: Identification of Immoveable Cultural Properties in Birecik, Halfeti and Suruç districts; Excavation and Rescue Work at Hasankeyf Archaeological Site; Project for Environmental Arrangements in Acırı (Midyat-Mardin) Archaeological Site; Mardin Participatory Urban Rehabilitation Project, Zeugma Urgent Excavation and Rescue Project and the project for the Survey of Archaeological Sites in Southeastern Anatolia.

The region has also endemic species of plants and animals, especially birds and fish, owing to its dual nature (desert and wetlands). The GAP envisages large scale social and economic transformation in the region mainly through the utilization and management of water resources. As such, the project is transforming dry steppes into farmlands and river beds into dam lakes. While boosting agricultural output in the region, this transformation also brings along the risk of jeopardizing the natural habitat of many species. To take timely measures against this risk, the GAP-RDA launched a project for the assessment of biodiversity in the region, which was
completed in 2004. The "Wildlife Project" envisaging improvements in natural habitats is going on since 2002.

5.5 Protection of Cultural Heritage

The Turkish governmental organizations cooperate with all related national and international institutions with utmost sensitivity and provide technical and financial support in order to bring into the light, to rescue and to transfer to the future generations the historical and archeological heritage that may be affected by the water resources development projects.

The Southeastern Anatolia Region plays a very important role in the history of civilization.

The sites, ruins and monuments link the past to the present. The upper part of Mesopotamia, The Fertile Crescent, with favorable geographic conditions is irrigated by the Euphrates and Tigris Rivers.

![Figure 5.6 Scenes from excavation sites](image)

The significance of the Southern Anatolian Region is not limited to the fact that it is part of ancient Mesopotamia; it is also a region where the Middle East cultures merged with Anatolian civilizations and where one can see remains of these ancient civilizations.

The Southeastern Anatolia Project initiated by the Turkish Government has served as a milestone in improving both the region and the country. The project includes the construction of several dams on the Euphrates and Tigris Rivers in order to regulate water resources. These mega-projects play a very important role in the present and future development of the region, not only for irrigation but also for producing electricity. However, the region has a very important
historical and cultural heritage that needs to be protected and recorded for the benefit of future generations.

The oldest of these archeological rescue projects is the “Rescue Project for the Archaeological Heritage under the Keban Dam Reservoir” which was started in 1968. Within the framework of this project, systematic excavations were carried out in more than 20 places by Turkish and foreign archaeological scientific institutions between 1968 and 1975.

The main concern of another rescue project called “Salvage Project of The Archaeological Heritage of Ilısu and Karkamıs Dam Reservoirs” in the region is to preserve the cultural and historical heritage as much as possible, considering the past experiences with the Keban, Karakaya and Atatürk Dam Projects.

According to the project it is planned to preserve some of the archaeological heritage on-site if possible, to transfer the movable ones to suitable sites and to document the ones that cannot be moved, and by this way, to transfer knowledge about these heritage to the world and new generation.

For the purpose of complying with the international principles on archaeological heritage conservation and management in a more productive way during this project, it is suggested to make preparatory work on the project organization and sub-project formulation.

Hasankeyf, will also partly be inundated. A rescue project at Hasankeyf has already been initiated. In this framework, a database of the cultural heritage is being prepared by the Turkish authorities according to the provisions of the European Convention on the Protection the Archaeological Heritage.

In addition to the above mentioned studies in the GAP Region, similar studies are also conducted in the other parts of the country. Some of good examples are Tahtalı and Yortanlı dams located in western part of Turkey.

More than 1500 ancient remains were brought to the light and started to be exhibited in the Izmir Archeological Museum. Additionally, in order to transfer those immovable cultural remains found in the excavation region to future generations, their photographs were taken and their plans were prepared and archived.
CHAPTER 6 - TURKEY’S TRANSBOUNDARY WATER POLICY

Turkey, like many countries today, faces challenges in efficiently developing and managing its water resources while working to maintain water quality and protect the environment. To add to the challenge, Turkey needs to continue to develop its water resources in order to assure its economic and social development and to keep pace with its growing and modernizing population.

According to a widespread perception, Turkey is a “water rich country”. Contrary to the general perception, Turkey is neither a country rich in water resources nor the richest country of the region. Given its growing population, rapid urbanization and industrialization, Turkey is expected to become a water stressed country by 2030. The amount of water per capita of Turkey is far below the average amount of water per capita in European countries. Therefore, Turkey is obliged to use water resources sustainable, both at the national level and in the transboundary context.

Turkey considers water as an important engine for sustainable development. Turkey holds the view that freshwater is an economic as well as a social commodity, and that it must be addressed comprehensively. In other words, water resources development, management, use and protection needs to be planned in an integrated manner taking into account all the economic and social needs of the people as well as environmental factors. Accordingly, Turkey has been developing this precious resource in an equitable, reasonable and optimal way.

As a developing country, Turkey has to make use of its hydropower potential to achieve sustainable development. Infrastructure, such as dams, reservoirs, hydroelectric power plants, irrigation, drinking water and sanitation systems is crucial for satisfying basic human needs, the eradication of poverty and for economic growth. In this regard, Turkey believes that hydropower is vital for sustainable development as it is affordable, renewable and clean.

The climatic conditions of the country also affect the water resources development policy. Because Turkey is a country situated in a semi-arid region at which precipitation is limited to 5 to 6 months per year, it needs to store water during the brief season of rain and snowfall, in order to use it throughout the year. The regulation of the flow of the rivers to prevent floods is another factor that has been taken into consideration during the development of water infrastructure projects. Therefore, dams and reservoirs play a crucial role in supplying safe drinking water,
providing sufficient water for domestic use, hydropower, irrigation and the environment, and regulating the flow of rivers. In the light of these considerations, Turkey has no choice but to build dams, small or large, depending on the size of its rivers, and to improve its water storage capacity.

While building dams, Turkey has always been cognisant of environmental and social conditions and of the requirements of the downstream countries. The dams built by Turkey have served the interests of the lower riparian states as well. The success of Turkey’s dam system was shown when Turkey was able to provide water both for its own needs and to meet downstream needs during the driest summers of various periods.

Transboundary waters constitute 40 percent of Turkey’s water potential. Turkey is a downstream country as well as an upstream country. Turkey is an upstream country on the Coruh, the Tigris, the Euphrates, the Kura and the Aras, but a downstream country on the Meriç and Asi (Orontes).

Turkey’s transboundary water policy aims at the efficient utilization of transboundary water resources and sharing the benefits through cooperation among riparian states. Contrary to certain perceptions which present transboundary waters as a source of conflict, Turkey has always considered water as a source of cooperation with its neighbours. Turkey is of the view that lasting solutions to transboundary water issues can be reached through confidence-building measures. Turkey believes that the efficient use of water in a transboundary context requires a proper and detailed exchange of information among riparian states, who should adopt a comprehensive approach to the matter. Turkey believes that bilateral and riparian-only approaches are the most appropriate and result-oriented methods for resolving any disputes that arise during the utilization of transboundary water resources. Global approaches are not necessarily practical.

Turkey believes that transboundary waters have their own specific characteristics and peculiarities. Each case of a transboundary water has its own social, economic, developmental, cultural and historic aspects. For this reason, the involvement of third parties cannot be fruitful for the settlement of any disputes. The issues may turn out to be complicated due to specific political, sociological, historical and cultural factors. The best approach is therefore to seek a solution among riparian countries. Mediation is not considered a workable option either, as each country has its own priorities, which could only complicate the situation.
Turkey is of the view that each riparian country in a transboundary system has the sovereign right to make use of the waters in its territory. However, riparian countries must also make sure that their uses of transboundary waters do not do significant harm to others. Turkey is always eager to find ways of reaching a basis for cooperation which will improve the quality of life of the people of the riparian countries. The point of departure should be the identification of the real needs of the states.

Turkey believes that transboundary waters should be used in an equitable, reasonable and optimal manner. Equitable use does not mean the equal distribution of waters of a transboundary river among the riparian states. Equitable use means the efficient and effective utilization of water, including the application of demand management principles, the use of modern water infrastructure and the implementation of water-saving irrigation techniques. “Sharing waters” among the riparian states is not a useful approach, as one cannot share a commodity which is constantly changing in quantity and quality in time and space under variable conditions of the hydrological cycle. Instead, the principle of sharing the benefits at basin level should be pursued.

Transboundary waters have always emerged as an important theme during cooperation and peace settlement processes. This issue becomes much more critical when water is a scarce resource, as it is in the Middle East. From this point of view, the Tigris and the Euphrates, which constitute almost thirty percent of Turkey’s freshwater potential are among the world’s most famous transboundary rivers. Both rise in the high mountains of North-East Anatolia and flow through Turkey, Syria and Iraq before eventually merging to form the Shatt-al Arab, 200km before it flows into the Gulf.

Turkey contributes 31 billion cubic meters of water to the Euphrates - about 89 percent of the annual flow of 35 billion cubic meters. The remaining 11 percent comes from Syria. Iraq makes no contribution to the flow. In the case of the Tigris, the picture is entirely different. 52 percent of the total average flow of 49 billion cubic meters comes from Turkey. Iraq contributes all the rest. No Syrian water drains into the Tigris.

With respect to the utilization of the waters of the both rivers, Turkey has consistently abided by “good neighbourliness” principles, and has continued to release the sufficient amount of water possible, even during the driest summers or drought periods, aided by the dams and reservoirs built in the context of the GAP.
The combined water potential of the Euphrates and the Tigris Rivers is, in the view of the Turkish authorities, sufficient to meet the needs of the three riparian states provided that water is used in an efficient way and the benefit is maximized through new irrigation technologies and the principle of “more crop per drop” at the basin level. The three riparian states should express their political will to engage in genuine cooperation and their readiness to exchange information and data on this issue.

Turkey is also the upstream country on the Çoruh River. The Çoruh River is located in North-East Turkey and is shared only with Georgia. Approximately 91% of the basin’s drainage area is in Turkey, and Georgia’s share amounts to 9%. Regular joint technical meetings are held between Turkish and Georgian experts concerning the construction of dams in Turkey. The necessary measures have been taken to ensure that such water infrastructure projects are realized and run in an environmentally manageable and socially acceptable manner. As the flow of the Çoruh is erratic, the dams which have been built and are under construction in Turkey will benefit both sides by helping to regulate the flow of water.

The Kura-Aras basin is located in the South Caucasus, with Turkey as the upstream country. It is the most important watershed in the region in terms of surface area, water flow and socio-economic value. The water shed extends over 64% of the territory of the South Caucasus including parts of Turkey, Iran, Armenia, Georgia and Azerbaijan. A variety of climates, precipitation conditions and landscapes can be observed in the basin.

Turkey is the downstream country on the Meriç, Tunca and Asi (Orontes). Greece, Turkey and Bulgaria share the water basin of the Meriç. Several meetings have been held on flood protection, joint infrastructure projects and the conservation of protected areas. Bilateral and trilateral relations have improved over the last decade with respect to the utilization of the waters of the Meric.

As for the Orontes, there is a need for reliable data on the water resource potential and the actual use in upstream riparian countries.

In the context of transboundary waters, attention also needs to be paid to transboundary groundwater. In the case of the Turkey-Syrian transboundary groundwaters, both countries should develop strategies to control groundwater extension in order to halt overuse.
To summarize, Turkey has been keen to apply internationally agreed principles and to act in accordance with the requirements of environmental and social impact assessments during the utilization of transboundary rivers. In this context, Turkey has signed and ratified the various conventions such as the Ramsar Convention on wetlands, the Convention for the Protection of the Mediterranean against Pollution and the Convention on the Protection of the Black Sea against Pollution.

On the other hand, Turkey is not a party to the Convention on the Law of the Non-Navigational uses of International Watercourses. Turkey voted against the Convention, because of her objections to its preamble and to several of its articles. Turkey believes that, as a framework convention, the text should have set forth general principles. Instead, it goes beyond the scope of a framework convention and establishes a detailed mechanism of notification. Moreover, the Convention does not refer to the sovereignty of the states over the parts of transboundary watercourses located in their territory. As will be recalled, a number of states who abstained or voted against the Convention pointed out that there was a lack of balance in its provisions between the rights and the obligations of the upstream and downstream riparian states. Moreover, in the 11 years which have followed its signature, the Convention has lost its credibility, given that it has been unable to attract the number of ratifications needed for its entry into force.

Turkey has always stressed the principle of “good neighbourliness”, which considers other riparians’ interests when dealing with transboundary rivers. In this context, Turkey believes that sharing the benefits of water among riparian states is one way to ensure confidence building.
CONCLUSION

Water is a finite and vulnerable resource, essential for sustaining life, the environment and development. The implementation of action plans and programmes for the reasonable and optimal utilization of water resources is therefore essential if globally accepted goals are to be reached. Conscious of these facts, Turkey has been developing its water management policy based on the present and future water needs of its growing population, rapid urbanization, irrigation, hydropower and the environment.

Among the major challenges that have to be overcome are the threat of water scarcity due to climate change and the inadequate sanitation resulting from unorganized settlements in some localities. Extreme events such as floods and droughts are also frequent. Water management activities therefore have to incorporate the development of early warning systems and water quantity/quality monitoring programmes, and the implementation of contingency plans, as well as structural improvements in water infrastructure, raising public awareness on efficient water use and the protection of the environment. Enhancing coordinated action is also very important for assuring the success of mitigation and adaptation measures for global changes.

Agriculture, which accounts for 74% of Turkey’s current water uses, will remain the main water consuming sector in the future. For this reason, Turkey has made significant investments since the 1970s in the development and improvement of water infrastructure and irrigation facilities. In order to conserve water and increase agricultural production, new and more efficient irrigation techniques which minimize environmental impact have been promoted. The GAP in the Tigris and Euphrates Basin, which is literally turning near-desert areas into fertile farmland, is recognized as an exemplary case, of the transition from simple water development to efficient water management.

Since there is a strong relationship between sustainable water management and economic development, it is of prime importance to ensure investment in the water sector while taking environmental concerns into account. In order to overcome the financial barriers to investment, private enterprises, both local and foreign, have been encouraged through the BOT model.

The climate pattern is another key factor in water resources management policies. Turkey experiences four seasons a year, with considerable differences in climatic conditions. This makes water management essential if water requirements are to be met at all times and in all places. In
this regard, the construction of dams and reservoirs is essential to regulate the uneven distribution of natural water flows.

Water and energy are the two important engines of sustainable development. In the energy sector, the basic policy of Turkey is the provision of cheap electrical energy on time and in sufficient quality and quantity. Investments in hydropower deserve special support as they are clean and have a long economic life-span.

Transboundary waters constitute 40 percent of Turkey’s water potential. The country’s transboundary water policy seeks to utilize and share the benefits of transboundary water resources efficiently through cooperation among riparian states. Contrary to certain perceptions, which present transboundary waters as a source of conflict, Turkey has always considered water as an area of cooperation with its neighbors. The efficient use of water in a transboundary context requires a proper and detailed exchange of information between the riparian states. Such an exchange is also essential for sound integrated basin management.

Turkey’s policy regarding the use of transboundary rivers is based on the following three principles:

- Each riparian state of a transboundary river system has the sovereign right to make use of the water in its territory.
- Riparian states must make sure that their utilization of such waters does not inflict “significant harm” on others.
- Transboundary waters should be used in an equitable, reasonable and optimum manner (‘Equitable’ use does not mean the equal distribution of waters of a transboundary river among the riparian states).

To conclude, the development of water resources constitutes an important element in Turkey’s economic development programme. There are several outstanding challenges which constitute the basis for future action. All of these need to be overcome by developing this precious resource in an equitable, reasonable and optimal way. Therefore, it is of considerable importance for Turkey that the development, management, use and protection of water resources should be planned in an integrated manner taking into account all the economic and social needs of its people.